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CONTENTS.

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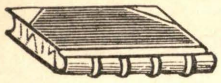

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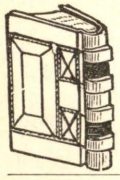

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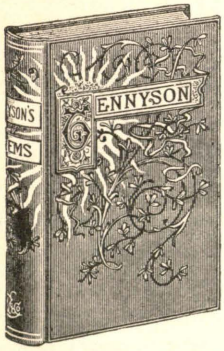

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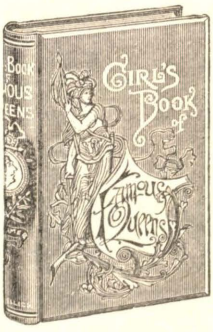

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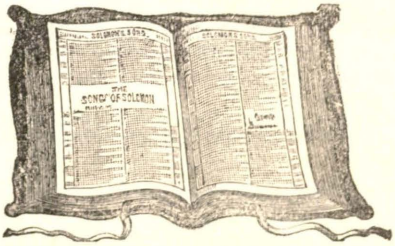

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THE STUDENT.

VOL. I. NOVEMBER, 1891. NO. 11.

MONEY AND MORALS. II.

An address delivered by COL. HENRI WATTERSON before the Scientific Class of '91, Aug. 12, 1891.

THIS brings me back to what I was saying a while ago about Canada and Mexico; or rather about some of our late friends who have found these countries so attractive that they have gone to pay them an indefinite visit. Do you know that for many of those men I have a sympathy which I cannot repress and which I would not repress if I could? I do not believe that every man who has come short of his accounts is necessarily a scoundrel. I do not believe that every refugee must needs be a thief at heart. I believe on the contrary, that if the truth could be got at, it would be found that in many cases there was a purpose, an effort even down to the very hour of flight, to repair the wrong done in moments of sanguine expectation, in the moments of deception or reckless despair. In cases of official delinquencies, how often they spring from the neglect of the official to keep his public and private accounts separate and distinct. Of a sudden he discovers a shortage. He promises to make it good; a year passes; then he takes a risk. This fails of course. Then he makes a fatal plung and down he goes in the vortex. These are ordinary cases which we meet in every day life.

The gambling mania seems to be universal, and the gambler never expects to lose. There is always before his mind's eye the mirage of that capital prize in the lottery of life. Among those who have habitually played for money it is observed they laugh when they win, and swear when they lose. Certain it is they must do one thing or the other. One would suppose such a person would be more stoical. It is not so. Each sitting is to them as if it were their last. I have known a man who plays deliberately to lose; he is correspondingly angry when he fails to win. It is a mistake that any man makes who lays his hand on a dollar that he cannot honestly call his own. I know something about that myself. When I was a boy I got a lesson in that direction which has lasted me a life time. I was elected by my school mates one of the editors of the periodical of our literary society and was subsequently re-elected term after term until the entire management of that paper came into my hands. I was editor and managing edi-

tor, secretary and treasurer. Well, one day it happened,—it was just at the moment when I was required to bring in my official report—it always happens so—I found I lacked four dollars and fifty cents money enough to balance my books. I must get that money somehow or falsify those books. Well, I did not have the money; I had spent it, and what was the worst I had overdrawn my own private account. I was simply aghast. I lay the whole night in alternating anguish and speculations. I arose in the morning haggard but resolute. I went directly to the guardian angel who had charge of my financial affairs and made a clean breast of it. "What is the amount of this defalcation", said he. "Four dollars and fifty cents", I gasped. I shall never forget it. I can see at this moment the queer, quizzical expression that came over his kindly, homely, weather beaten face as he handed me a check. He said, "There, my boy, is five dollars. It is an ugly piece of business. Don't allow it to happen again." And it never has.

Among those who thus seek to lay their hands on the goods of another in disguise, it seems to me, the worst is the man who is the boasted pillar of the church; who masquerades as a model of commercial integrity. He not only robs those who trusted him, believed in him, but he commits a great moral crime. The shock he inflicts on our faith in human nature is hypocrisy and villainy. I recall a very curious episode that happened a board of directors in a bank in one of our great cities a few years ago. A particular member had duplicated warehouse receipts in a considerable amount, and borrowed of the bank on this collateral. His friends raised the money and paid the notes and the matter was hushed up, but not, however, without the earnest protest of two members of the board, who said they thought it was not right; that it was compounding a felony; that it was not fair to turn such a scamp loose upon the unconscious community. However, their moral susceptibilities yielded to entreaty, the money was raised, the notes paid, and there the matter ended. Six months later one of these protesting mortals fled to Mexico and left behind him one hundred and fifty thousand dollars duplicate warehouse receipts, forged paper, and raised checks. His surviving partner in morality was shocked beyond description, and went about wringing his hands and denouncing the villainy right and left. Six months later this gentleman's turn came around. He fled to Canada and left behind half a million dollars raised on bogus security. Now, what do you suppose came to pass? Why, the original sinner, the man who had been saved from ruin by the silence of the bank and the generosity of his friends, actually served as foreman of the grand jury that indicted the other two. That sounds like a fable but I knew all the parties well. "Hypocrisy," the witty Frenchman says, "is that homage that vice pays to virtue." It is also the mask by which pretended virtue oft seeks fame. We find it everywhere in society set up by the wealthy few representing the others in propriety, and setting themselves up as a model for their neighbors.

Which of us has not had his fingers burned by corner lots bought in cities which never existed, and found no relief in watered stocks no matter how coldly applied to the wound. Which of us as an act of great friendly favor, has not been admitted to the ground floor of

financial devices and been ruined? Hazlitt tells us that the only honest hypocrites are the play actors who are in the robes of the king to-day and the rags of the beggar to-morrow. There is a hypocrisy that is so deep that it goes maundering through the world mistaking itself for virtue and never finding itself out. Then there is a hypocrisy that proceeds from cowardice rather than from virtue. How many a man has lied to save appearances. Every age has its idiosyncrasies. Every country has its virtues and its vices, its crown of glory and its crown of thorns. Find out a nation's sorrow and you shall know that nation's danger. That is a question which should interest us unceasingly. Never mind about Europe, Asia and Africa. What is the matter with America?

Is it the failure of our municipal authorities to bring efficient and honest government to our great cities? That is certainly a great menace to our centres of population, but I hardly think that it is broad enough and deep enough to cause national ruin. Is it the race question at the South? That, too, is a great menace everywhere to the people who live there. It is a problem the solution of which the wisest have not been able to compass and the end of which the most sagacious mind cannot see. For my own part I know so much about it that I long ago ceased to have any theory at all. Indeed I have been thrown back at last upon the simple and sublime faith in God who can raise up as well as cast down, and who doeth all things well.

Is it the labor question? the social question? the question of free and fair elections? I think not. In so great a democratic Republic as ours where all things are open to all men, these things in time can settle themselves; left to the operations of our electoral representative machinery, there can never be any general motive for again resorting to combustible agency or revolutionary explosives. We are not fenced by any feudal bonds the bursting of which means blood and terror. We are not the slaves of any artificial convictions which, growing obsolete, can only be abolished by dynamite in the hands of anarchy. The poorest babe that steals timidly into the world by the back door has the same chance of becoming president of the United States that the richest has.

Now, it may be that there is some one here to-night who is disposed to ask me whether I do not think that the greatest evil that threatens the country is the tariff? Well, my friends, that old sinner has been sinning a long time. He is a mighty tough citizen into the bargain. He has grown enormously rich and proud and works a great revival and makes himself mighty active and agreeable, particularly about election time; is very positive and conceited at all times; knows more than is given to anybody to know because half what he knows is not true, and the other half is past and forgotten. But I do not despair. He has had a good deal of fat fried out of him lately and he ain't nearly so stout as he was. Now, I am afraid of no one single issue at this time between the people which keep to the right and left in party lines. There has never been a moment in the history of this country when there was less to be feared from discussion among the professional politicians, and when they, speaking in a philosophical and oratorical spirit, it seems to me, attempt to keep up division in our parties, because we

have four or five now they tell me, it makes up the sum of what I call mighty small politics.

The issues that divide us to-day are trifles, light as air, by comparison with the difficulties and dangers that we had to face thirty years ago during times that indeed tried men's souls. I have in my own day seen the Federal Union survive an irrepressible conflict sown in the blood and marrow of social order. I have seen the Federal Union, not too strongly put together in the first place, come out of a great war of sections stronger than when it went into it. Sixty millions of God fearing men and women, thoroughly homogeneous and reconciled.

I have seen the constitution of the United States strained, not merely in a reconstructory ordeal or a presidential impeachment, but in a dispute of the count of the electoral vote and congressional dead lock of a majority of the constitutional tribunal, and yet stand firm as a rock, as the hearts of the people themselves, yielding itself to the flexible needs of the country. Finally I saw the gigantic fabric of the Federal government transferred from hands that held it for a quarter of a century to other hands without so much as a bloody nose, after a fight that had been so close that a single vote might have changed the result.

A man who has seen all these things and who has borne his part in the awful responsibilities of the country is not going to lose much sleep about what is going on in Washington, or make himself very unhappy because the tariff has been raised, or the duty on fruit has just been changed from forty to forty-two per cent.

Let us by all means be honest in our appropriations, frugal in our expenditures and otherwise careful of the people's money. Let us examine well the matter of new legislation. The parties are too evenly divided, too evenly balanced, and the questions that divide them too petty and local to be expedient or to raise in the mind of any thoughtful man the apprehension that the country is going to smash if such and such an Act of Congress is passed, or if such and such another Act of Congress is not passed. Undoubtedly the danger that threatens us is the danger raised directly from the relation of money to the moral nature of the people. We have no great aristocratic titles or patents of foreign nobility, and the money standard naturally becomes the simplest and readiest of all standards. "Put money in thy purse" seems to have become a national motto. This would not be so apt if limited to commercial affairs, but we find it everywhere, from the ten-thousand-dollar-a-year pulpit to the hundred-thousand-dollar-Senator of the United States.

I remember some doggerel verses that went the rounds of the newspapers when I was a boy and which made a lasting impression. I can still recollect some few of them.

"As with cautious steps we tread our way through
This intricate world as other folks do;
May each on his journey be able to view
The benevolent face of a dollar or two.

The gospel is preached for a dollar or two;
Salvation is reached for a dollar or two;
You can sin sometimes, but the worst of all crimes
Is to find yourself short of a dollar or two.

But how true it was, and how ready we are to forget the sins of the rich and to forget how they got their money; to stick our feet under their mahogany, to drink of their wine. What a struggle

it is in the great centers, all money, money, nothing but money.

When Louis Agassiz was offered one hundred thousand dollars for a hundred lectures, he turned away from the tempter. "What time have I to waste on money making." People thought he was crazy. I would to God we had an Agassiz or two in every community through this land. But the honorable objection seems to have become one of the lost arts. Fame without money is love second hand. The geniuses of the country are no longer engaged in works of patriotic duty, in works of humble piety. They are engaged in building, in construction, in developing, in money making. The young fellow with a head on his shoulders, a heart in his bosom, turns away from the rewards of public life to that which is cash in hand. He says, "I cannot afford to take five thousand dollars a year when I can make five and twenty thousand dollars. I will make my fortune first and then if I am not too old I will buy me a seat in the Senate of the United States."

Believe me, there is more happiness to be got out of a mind of honor, out of a mind of virtue than can be extracted out of millions of money. I do not mean you are to understand me that the poorest are the happiest, and yet by a curious paradox it is certainly true that the people who are relatively poorest on earth are the proudest and happiest. I mean the people of Switzerland. In that country we find the ideal Jeffersonian Democracy. The government is frugal and simple. The officials are paid poorly. The President of the Swiss Republic receives less than a thousand dollars a year. Elections are held annually, so there is no motive and opportunity for corruption. In fact they are held in the churches and on Sundays. The greatest of the modern Swiss statesmen, a man who had served many times as president of the Swiss Republic died a few years ago in a dingy little apartment.

We are the most happily situated of any people on the earth. We have the most perfect system of government ever devised by wit of man, a system so perfect it is sure to draw to itself all the nations of the earth. We have nothing to fear from without, not even Italy, and from within, but two great moral dangers. One of them is lust for money, and the other the development of a party spirit. I gave them names a few years ago which stuck to them. I called one of them the Money Devil. This money devil is a lion right across the national highway, standing just at the forks of the road; one of them leads up the steep incline of national fame and glory; the other leads down through plutocracy. It is opening its vicious jaws and licking its bloody lips to swallow up all that is noble in national life. It costs a million dollars to set a President in the field; a hundred thousand dollars is spent for a contest in the Senate of the United States. How long shall this be true of men who run for public offices? and the Presidential chair itself not a mere commodity to be auctioned off to the highest bidder. Beware of the money devil. Beware of the man who puts his conduct above his conscience, his party above his country. I don't mean or care to argue that it is necessary that a man shall sacrifice any private duty to be true to his country, or prevent any citizen of the United States to be true to his conscience. Let every man entertain his conviction and leave his neighbor alone. Let him

not think more of himself, or of his neighbor less because that neighbor decides to go the same road after the same thing.

Let us turn away from the darkest side of the page to the brighter and blessed legend, "Do thou unto others as thou wouldst that they should do unto you." Believe me, therein is to be found the whole sum of human happiness.

Of all the great speeches that Shakespeare has put into the mouths of his heroes, it seems to me that the most wisdom and comfort are to be found in the words addressed by Wolsey to the one lone follower who survives.

"Cromwell, I charge thee, fling away ambition:
By that sin fell the angels; how can man, then,
The image of his Maker, hope to win by it?
Love thyself last; cherish those hearts that hate thee:
Corruption wins not more than honesty.
Still in thy right hand carry gentle peace,
To silence envious tongues; be just, and fear not:
Let all the ends thou aim'st at be thy country's,
Thy God's, and truth's: then if thou fall'st, O, Cromwell,
Thou fall'st a blessed martyr."

There is an epitome for all the world, by one who treaded all the shoals and depths in preference to virtues, only to find, when it was too late, how weak are strength and pride, and how poor the power of money. Believe me, the statesmanship which is to lead up the heights of national fame and glory must trust itself more to the moral nature of the people.

If I were delivering a sermon to the people of New England I would say to them: Don't imagine because you have struck these rocks with the rod of genius and virtue, and have made them to blossom like the rose, do not imagine that there is no other genius, no other virtues in the world. Go down South and bathe in the sunshine you shall find there and take a few lessons from the old time planters' simplicity and honor and truth. You will feel better for doing so; you will be better for doing so. And if I were delivering a sermon to these same planters of the South, I would say to them: "Gentlemen, all this clinging to fancied superiority and social supremacy and patrimony is sheer prejudice and folly. These Yankees are just as good as you are and in many things they know better how to get on in the world. Send your boys up there and let them learn how to work for a living —in many cases it will be but a visit to the homes of their forefathers, for many of the proudest families in the South trace back their ancestors to the blue laws of the Pilgrim fathers. And thus would I bring the good in one section face to face with the good that is in the other section, instructing both in the truth that we are the most homogeneous people on the face of the globe, differing only in personal, local and external characteristics. And thus I would hope to rebuild our great Republic and plant it anew on the firm foundation of morality and manhood, the only genuine source of a people's worth.

GROGAN'S DISAPPOINTMENT.

HON. MARK L. DEMOTTE.

A FEW days before The Delight, as Grogan was returning from a ride of twenty miles down the Coon Valley, he saw a couple on horseback riding down the mountain. They entered the main road a short distance behind him and galloped off in the direction from which he had come. A glance satisfied him that one of the riders was mounted on Amy's horse; another, that it was Amy, and that his companion was a tall, fine-looking young woman, with a mass of black hair floating over her shoulders, mounted on a spirited white horse on which she sat with grace and ease.

"Well, I'll declar," he said to himself, "a keepin' company with the gals; sich a lady-like gal, too. The leetle rascal. Wonder who she kin be. No folks 'round yer; too much quality. Wuzn't she purty though? Hit beats me. Mebbe he'll be wantin' to marr-y some uv these days. Him marr-y!" He laughed aloud. "Hit'll be a long time afore that."

The sight had pleased him, and he rode the remaining five miles to The Bowl recalling it, and wondering who the woman was and how Amy got acquainted with her.

"Marthy," he said on arriving at home, "whar d' you s'pose I seed the boy? Hit beats all," he continued, laughing heartily. "He wuz ridin' 'longside uv a gal; a stavin' purty one too. I've been tryin' to figger out who it wuz, but I can't. Hit wuzn't none uv the Simses, fur I know 'em all. Hit wuzn't a Matticks, fur they're short gals. Hit wuzn't Puss Lewis nuther. She's tall enough, but her har ain't black, an she hain't no sich riggin' as that gal hed. To tell you the truth, Marthy, that young woman was jist, ah, jist gorguous; who kin hit be?"

There was some embarrassment on the face of his wife.

"You ain't ashamed to tell me, air you Marthy? You don't mean to 'sinuate that he's a keepin' company with trash?"

"I expect it was Bettie Bramlett," she replied.

"Jeemses rivers!" said Grogan angrily. "A Grogan riding alongside uv a Bramlett! You don't mean to say that, do you Marthy?"

"She was at school three years in the same town with Amy."

"That couldn't make frien's uv the Groganses an' the Bramletts. What makes you spect hit, Marthy?"

"He has visited her several times since he came home."

"An' we'n you fust found hit out you tole him immegit hit wouldn't do?"

She made no reply.

"You marr-ied the name uv Grogan," he continued, "an up to the present minit you've stood by it as if you'd been born'd in it. Hit ain't possible that you're goin' to quile down afore them Bramletts; you're goin' to come down flat footed an' say he shan't do it?"

She was still silent.

"Well, I'll take it in hand myself an' it'll stop."

When Amy returned his father pro-

ceeded to give him a history of the feud between the Grogans and the Bramletts, and added, "To my way a-thinkin' no Grogan with the sperrit uv a mouse will 'sociate with a Bramlett."

The young man defended his love and his sweetheart with a manly eloquence that astonished the father.

"Them's fine languages I know," he rejoined when Amy had concluded, "but a Bramlett's a Bramlett all the same. I haint never been hash with you an' don't never want to be; but I tell you plain, hit must stop. Act the man with the gal. Go see her wunst more; mind, wunst more. Tell her hit's stopped; an' never you go near her agin."

On the morning of the third day, after Amy had received the commands of his father, he rode off in the direction of Bramlett's. At noon of the same day one of the farm-hands brought a note for Grogan, which he said had been given him by a strange man. Mrs. Grogan read it to him. It ran thus:

DEAR FATHER: I came to see Miss Bramlett as you directed. I am with her now. I have told her all you said to me, and we have carefully considered it. We are both of one mind as to what we should do. We are not ashamed of it, and therefore do not conceal it. We go to Miss Bramlett's aunt's at Greytown, where we will be married. Your son,

AMOS GROGAN, JR.

"The—good—Godelmighty!" said Grogan as his wife pronounced the last words. "Marr-y her! marr-y a Bramlett!" he continued at the top of his voice, striding about the room. "He shan't do it. I'll foller 'em to the eend uv the world. Git the hosses, men. Saddle the two bays and the yaller mar, an' both uv you git your pistols. Ef he don't keer nuthin' for his pap, he shan't disgrace him. I'll ketch em, an' wen I do, I'll give him a whoorpin' he'll remember at the jedgement day. I'll do it right afore the gal. I'll war out a whole thicket uv sprouts on him, an' make him git down on his knees to beg."

His wife remonstrated with tears.

"Never you mind, Marthy. I'll hurt nothin' ceptin' his skin, but thar won't be a piece uv that as big as two bit as won't hev a welt on it."

About sundown Grogan returned with his arm in a sling and his clothes bespattered with blood. In answer to his wife's anxious queries he replied:

"I went a huntin' a boy with a hoop: I found a man with a pistol. That man, Marthy Grogan, was Amos Grogan, Jr., our son and arr. I found him with the woman uv his chice by his side, an' thar hain't a better lookin', higher sperrited couple in all the State uv Kaintucky. I'm proud uv 'em."

The Delight was three days afterward. A much larger crowd than usual attended. Grogan stood at the "bar'l uv peach" and warmed by frequent health drinkings, told the story of his pursuit after the runaway pair.

"This is a infar as well as a Delight, you see. Thar's the bride an' groom. Thar's sperrit an' beauty jined together. You're all a wonderin, how my son come to marr-y a Bramlett. I don't blame you. I tried to stop it, you know. Sich sperrit as they've both got won't be stopped. You see wen I fust 'yerd he wuz a keepin' company with her, I wuz awful mad. I tole him it had to stop immegit. I sent him to her to tell her he'd never go with her agin. He goes begiently an' sees her. Instid uv tellin' wat I tole him, he popped the question an' writ me he wuz goin' to marr-y her that day. I jist swore he should'nt. A couple uv the han's an' me sot out to ketch 'em."

"We found ther hosses hitched up 'yer at Hopewell. The par wuz in the tavern. Wen I wuz askin' the landlord whar they wuz, I 'yerd three pistol shots, one right arter the other, an' Ed. an' Jess Bramlett come a runnin' lickety split through the passage.

"I wuz mad'ern ever wen I seed the Bramletts, so I says ef hit's the Bramletts as wants to fight 'yer I am, an' I drawed an' cocked my navy."

" 'Hit ain't the Bramletts though,' says a feller who come a rushin' out arter 'em. 'They've got ther bellyful uv it. Hit's the young man as is doin' the shootin' an' he's hit both the Bramletts. He's got a gal with him an' he's fightin' fur her.'

" 'Wat young man, says I?' 'Young Grogan, from The Bowl, down yer,' says he, 'an' he's a thoroughbred, I tell you.'

"I wuz tuck back a leetle. You see, our son an' arr, the onliest one uv' leven, you know, wuz weakly like, an' hed a terble scrabble to live at all, an' I own up I'd miscaclated on him. I was blazin' mad an' didn't stop to think much, so I started down the passage to whar the shootin' wuz. One uv the fellers I hed along with me wuz fool-hardy like, an' wuz a leetle ahead uv me. The passage wuz kind uv dark an' wen we wuz about the middle uv it somebody said, 'stop thar,' an' then shot. The bullet grazed the feller's neck an' hit me in the arm thar. I s'posed hit wuz a Bramlett as shot an' I biled right over, an' says I, 'I'll hev Bramlett blood fur that, an' went right on.'

"Somebody hollered 'stop' agin, an' off to the left in a door, I seed my son thar, a coverin' me with a pistol. That gal as is his wife now, bless her purty eyes, wuz a stan'in' by him. 'Pon my word they 'peared a foot taller'n I ever seed 'em afore, an' thar eyes wuz a flashin'.

"Hit jist knocked me all uv a heap. I looked into his eye, then into the pistol bar'l, an' back and for'rard that a way a minit. I seed business in both of 'em, sho's you'r bawn. So I says, 'Hit's your pap, Amy.' He spoke right up, and says he 'ef my pap comes friendly, he don't need no pistol.' 'Jes so,' says I, an' I let's down the cock an' puts her in my belt.'

" 'This is Miss Bramlett says he, a takin' her by the han', 'I 'spect you've come to see her.' He'd allus seemed a leetle boy to me afore. All to wunst I seed he wuz a man, a man uv sperrit. 'I come,' I says, 'to see my son an' arr,' puttin' my arms 'round him, 'an' I'm proud uv him, an' the woman uv his chice.' Then I put my arms 'round her, an' says I, 'Sis, are you marr-ied?' 'No,' says she, 'but we would hev been ef they hedn't tried to pervent us.' 'Who's a perventin?' says I. 'My folks,' says she, 'Kin they do it?' says I. 'No,' says she, a straightenin' up. 'Not ef his catterges holds out.'

" 'Bless your purty eyes,' says I, 'Marthy an' me has ten gals, but we want another'n an' that othern's you. Come right along children to The Bowl an' be marr-ied at The Delight.'

" 'Thank you, father', says she, an' hit sounded mighty good uv her to call me sich. 'We tole 'em we wuz agoin' to my aunt's to be marr-ied, an' we're goin thar.'

" 'Said like a gal uv sperrit,' says I. 'I'll go 'long with you, an' ef thar's any mo' shootin' I'll take a crack myself.' 'No pap,' says my son, 'we'll make it alone.' 'So you kin,' says I, 'an' fur fear the catterges does give out, 'yers my navy with six good roun's. She'll

carr-y a hundred yards.' An' I laid her on the table. 'Farwell, my son,' says I, 'an' farwell his bride. The Bowl's ready, an' Marthy an' me's ready to give you a infar as 'll 'stonish the natives.'

"'This is the infar, an' hits a rouser. We're drinkin' to 'em in peach an' honey. The peach is him an' the honey's her. Yers' to 'em, that the marr-ige 'll be as good an' wholesome a mixture as the drink, an' wen' you've said that you've said all, fur thar ain't nothin' better'n peach an' honey."

"'Thar they go, as smillin' an' happy as they kin be. Hit would hev been wu'th a yer's growth to each one uv you ef you could uv seed that young man a holdin' the drap on his pap. Hit wuz mighty comfortin' to a father's heart, I tell you."

"'Drink hearty frien's thar's the peach an' honey."

HINTS ON TAKING COLD.

J. H. KELLOGG, M. D.

"I TOOK a hard cold early in the fall and somehow I could not get rid of it all winter." Remarks like this are heard altogether too often. A cold is a very serious matter, not merely in itself but in what it leads to in crippling the vital forces generally or specifically. Preventive work is always much more satisfactory than reformatory work, and this is as true in regard to health as in regard to morals. Neither a patched up character nor a patched up constitution can equal one without blemish.

One reason why people take cold in the fall is that they do not begin to readjust their clothing soon enough, nor change from time to time as the necessities of the season require. Some go by the almanac and lay aside or put on their flannels on a certain day of a certain month, regardless of any other consideration. But one day is cold and the next may be warm and there must be a continual change in the amount of our clothing to keep pace with these changes of temperature which are really a part of the toning up process intended by nature to prepare us to endure advantageously the cold of the winter season. If the cold settled down upon us all at once we would be sure to suffer from the shock.

We should remember when we put on a garment that it becomes just as much a part of our body as if it grew there, so far as temperature is concerned. It is a kind of artificial skin and we should regulate its thickness according to need, even if we make a change every day. This is the penalty which we pay for wearing clothing at all. Our forefathers, the ancient Britons, considered it a superfluity and their skins were toughened so that they could endure the severe weather incident to that climate at certain seasons without difficulty.

Be out of doors as much as possible and inure yourself to the state of the weather. Stimulate the action of the skin by tepid or cold baths and brisk rubbings, and kindle the furnace fires of the body with a greater amount of pure

oxygen from out-of-door exercise. The heat-making preparations of the body will be thus increased and as the difference between the external and internal heat is increased, we will have a brighter flame in our bodies as well as in our grates. Do not stay in for inclement weather and nature will store up heat and energy enough to enable you to resist inclemencies. If the sun shines, you will surely need to be out a great deal, and if it rains or the snow blows, put on overcoat or cloak, and leggings and overshoes and face the storm. If you shut yourself up in a close, hot room, you will doubtless have a cold all winter. Some people keep their houses actually warmer in winter than in summer—80° and 85° most of the time, with practically no ventilation. Additionally, they wear too many clothes, and then when they go out, their skins being relaxed and enfeebled from living in a close, hot atmosphere, they cannot help but take cold. The persons who suffer most from sore throats are usually those who wear comforters and mufflers in all sorts of weather and under all circumstances. They keep the skin moist and tender and so a slight exposure will bring on congestion. Reserve heavy wraps and mufflers for the most severe weather and for protracted exposures like long carriage drives. Wear enough clothing for comfort at all times, and by no means attempt any rash hardening process.

The clothing of the body should be evenly distributed, and to this end, union under garments for summer and winter are much to be preferred to those in two pieces which lap and bring additional warmth where less warmth is needed than at the extremities if there be any distinction made. Two suits of light flannel are warmer and more healthful because of better ventilation, than one very heavy suit. Many make the mistake of putting on too much outside clothing and too little under clothing. A garment which fits the body closely is a great deal warmer than an overcoat and a great deal cheaper. Every one should have a good supply of various grades of under clothing. The feet should be clothed all the time with boots or shoes of uniform thickness and they should be large enough to admit thick woolen stockings with comfort.

The clothing should be so adjusted that it is an easy matter to lighten it when entering a warm room from keen, cold out of door air. One of the very best ways to take cold is to keep on heavy clothing or wraps while sitting in a heated room and then go at once into the cold. We need to exercise great care in regulating the temperature of our school rooms and living rooms to see they do not become overheated. It will not do to be governed by the feelings ; a thermometer should be frequently consulted. A temperature of 68° to 70° is about right.

Proper ventilation should be attended to, for the breathing of air, foul with exhalations from the lungs and body, is exceedingly demoralizing physically and is predisposing to colds.

The cold weather of our northern clime is a universal tonic to all its dwellers. We breathe a little more rapidly ; we think faster ; we are more energetic, and are lifted to a higher plane of existence.

HOW TO STUDY.

A. REICHENBACH.

IN entering upon the discussion of this subject, I should perhaps define study as the student desires to use the term. In this sense study is an exercise of the mind, which systematically develops its faculties and stores it with knowledge.

According to the definition given, study must be performed by one's own mind and is a necessity for the development of its faculties. In order to exercise the mind, we must apply it to that which may be known by study; hence the mind also acquires knowledge in the process of its culture and development.

Good teaching disciplines the mind and makes clear much which was not well understood before, but never takes the place of study. It assumes that the teaching should be correct and systematic. The undisputed scholarship of some self-educated men with ordinary mental endowments, proves the assertion that thorough, systematic study without instruction is worth far more than instruction without study. If a lesson be well studied, the recitation will be acceptable, and the instruction which follows is received more attentively and more easily becomes one's own. The gifted student may wofully deceive himself in this matter. Careless study and fair recitations, with corresponding marks and a piece of parchment, will finally leave him far behind the dull, studious boy, in life's competitive battling for success.

Study thus assumes an importance which cannot be easily overrated. The definition already given also involves the purpose of study; its object is the successful performance of life's duties; its end is obedience to the divine will.

Further inquiry into the nature of our subject brings to light an adjustment of relations, which constitutes the laws of study; and an orderly manner of studying according to these laws, which constitutes the methods of study. We thus obtain the two leading divisions of our subject. As the first division is theoretical, it must yield much space to the second division, which develops the fundamental ideas underlying the words, "How to Study."

The mind must study something. Here we have a subject studying and an object studied, and each under fixed regulations. Hence we have subjective laws of study, or those derived from the human constitution; and objective laws of study, or those derived from the nature of the studies pursued. The subjective laws may be divided into two classes, namely, those which relate to the nature of the mental faculties, and those which regulate their practical application to study and the relation of the body to mental activity. The former class belong more properly to mental science and logic; but the latter fall entirely within the limits of our subject. These may be subdivided into laws of self-activity and the law of rest.

As to application to study, self-activity is governed by four laws; the laws

of arrangement, concentration, investigation, using the word in a limited sense, and continuance.

The law of arrangement requires that difficult lessons be studied at the time of day when mind and body are most vigorous, and the easy lessons when the student becomes tired; also, that the succession of lessons be such as will call forth a change of mental activity from one lesson to another.

The law of concentration requires, that the body be in good health, the stomach not oppressed with food, and the mind sound and free from trouble or frivolity, and that the will instantly control the desires and set the intellect to work at the moment the studying is to begin.

The law of investigation requires that the nature of the subject-matter be sought as suggested by the objective laws of study enumerated further on; and, that the discriminative power of the intellect act keenly, as the mainspring of correct analysis and as more or less fundamental to synthesis, comparison and contrast induction and deduction, generalization and classification. The work of assimilation begun by these processes is completed by repetition and retention. Recollection and reproduction by association and suggestion give the result of the investigation made. This law aims at systematic discipline of the mental powers, and, through this, at the acquisition of a vast amount of knowledge.

The law of continuance requires that the student persevere in study to the end in view, and that ample time be allowed for studying the lessons of the day and for completing the course of study begun. These requirements are conditioned on the age, capacity, health, and pecuniary circumstances of the student. This law is hostile to short courses of study and hot-bed schools of learning.

The law of rest stops all activity in study. It checks blind obedience to the law of continuance. Its chief condition is periodicity, brought about by alternating study with rest, and its object is recuperation. It requires cessation from study, at such times and during such intervals as will enable the body to recruit its strength and the mind to regain its clearness and vigor.

The objective laws of study are the following: 1. The law relating to material objects as such. 2. The law relating to qualities. 3. The law relating to actions or events. 4. The law relating to conditions. 5. The law governing the study of relations. 6. The law governing the study of spiritual substance, as such, through its attributes.

The law relating to the study of material objects requires that an object be viewed as a whole before pointing out its attributes as such; then, that visible objects be distinguished from one another before learning their names and definitions; and, lastly, that imaginary and spiritual objects be studied after material objects.

The law relating to qualities requires first, that qualities directly knowable by perception be studied in the order of the power of the senses to make impressions upon the mind, and that each quality be singled out by analysis, or comparison and contrast, and then all qualities be united by synthesis; and that attributes not directly knowable by perception be studied gradually, as the power of abstraction develops. According to the first require-

ment of this law, we should first see a mirror, hear a bugle, feel velvet, smell perfume, and taste honey. In each case the first impression made upon the mind also marks a characteristic quality of the object.

The law relating to actions or events requires that each one be carefully traced by analysis, that their order and connection be wrought out by comparison and synthesis; and that the series be critically reviewed for retention and reproduction.

The law relating to conditions, states, and hypotheses requires that physical conditions and states be studied before the spiritual, that logical conditions be connected with their corresponding conclusions, and, that hypotheses be used only where there are sufficient data for argument, demonstration, or for setting up a theory.

The law governing the study of relations requires that similarity and dissimilarity, superiority and inferiority, in objects, ideas, and thoughts be studied by comparison and contrast; that coordination and subordination be traced and practiced in generalization and classification; and that cause and effect be studied by induction and deduction.

The law governing the study of spiritual substance requires that it be last in the order of study, and that all the student's power of abstraction and reflection be brought to bear upon its attributes and relations.

The adaptation of studies to the age and capacity of the learner may be laid down as one of the most important prerequisites to correct methods of study. Unfortunately, many young learners are allowed to judge for themselves, in this important matter. They succeed about as well as children who cultivate plants by sowing seed upon the play-ground. How can an undeveloped mind plan a better course of study for itself than those which have been prepared by the ripest scholars and have stood the tests of ages? The learner should, therefore, place himself in the hands of competent teachers. There he can pursue a course of study, which will be safe to follow.

Having passed the entrance examination, he should make out a schedule for study and recitations, before he is ready to begin to study. Here is the next important prerequisite; for the question arises, When and how should each lesson be studied so as to prepare it well, without overwork? The faithful but inexperienced student is in danger of overtaxing his mind and losing his health by hard study at times when he should not study at all. Overwork and under-rest, on the one hand, and under-work and over-rest, on the other, have stamped future failure upon the first scholastic year, in many a student's life. There is a limit to the strain to be borne by the nervous system, just as there are limits of time within which no lesson can be mastered. Young learners are apt to go to either extreme unless the time for study be fixed and written upon a schedule and then judiciously followed.

To make a good schedule for study is sometimes a very difficult task. It may not always be possible to recite lessons at such times as would harmonize with the best arrangement for study. The distance of one's home from school, as well as the amount of one's work at home, may also interfere with the proper time for study. If these obstacles cannot be removed, the good student arranges his studies accordingly, and

takes care that no act of his stands in the way of arranging his time for study, as laid down in his schedule.

The law of arrangement is best carried out by most students, if they place the difficult lessons for study in the morning hours. Lessons in which the memory is exercised most should be studied before breakfast, care being taken not to study too long before taking food. Lessons in which prolonged reasoning is required are usually most easily mastered some time after breakfast. Some easy lessons may alternate with the difficult, and others may be studied just before dinner, or before retiring. The law of rest forbids study immediately after meals, on the ground that the blood needed to begin digestion should not be diverted from the digestive organs to the brain. Such double activity is particularly injurious after supper. Twenty minutes of rest after breakfast, an hour after dinner, and an hour and a half after supper, may be regarded as a good average for rest after meals, provided the student does not eat improper food, nor eat too much, nor eat between meals.

A good student will avoid studying a lesson just before reciting it, particularly if the studying be chiefly the work of the memory. He who cannot remember a lesson six hours must become still more forgetful by studying lessons immediately before reciting them. The memory should have time to be tested; and if the tests be properly made the memory will become more and more retentive. The true student does not study to recite merely, but to develop his mind and store it with knowledge for future use.

The arrangement of studies is also dependent upon the time for sleep. The average time for sleep is eight hours. Those who are physically weak and study hard are perhaps the only ones who should form the habit of exceeding this average. Seven hours ought to be the limit for all lazy boys. Some of these sleep at such a time as would lead one to believe that they might have descended from the owl.

The periods for recitations, meals, and rest, along with the proper order of studies, have enabled the student to locate the periods for studying his lessons, upon his schedule. How long each study-period should be, the young learner may not be able to determine without trial. The teacher may err in assigning lessons; they may be too long, and the law of continuance will come in conflict with recitations. Every case of this kind should be reported to the teacher without delay, so that the error may be corrected. Beginners should make trial schedules and copy them after all corrections have been made. The periods for recitations may be written upon one sheet and the periods for studying lessons upon another; but both can easily be written upon the same sheet, if the names of the days appear as headings of vertical columns and the periods or time-table appear at the left side. Provision can thus be made for exhibiting to the eye all the time for each day, both for study and recitations. The best way to distinguish study-periods from recitation-periods is to fill the spaces for the former with words written in red ink, and the space for the latter with words written in black ink.

With a corrected schedule in hand the beginner is ready to prepare good lessons regularly, so far as a schedule can be of service to him. It now remains

for him to follow it faithfully in order to make it really valuable. Unless he does this, his time will probably be wasted and his money or some one else's lost.

The student should know why two students of the same intellectual capacity and apparently alike in diligence differ so widely in the preparation of their lessons. Men usually say that the one studied harder than the other, and the young student accepts the statement without further reflection. At this point, therefore, a partial analysis of the processes of mental activity is in order.

The law of concentration leads him to give undivided attention to his lesson. All the attractions surrounding him do not move him. His whole mind is fixed upon the subject before him and lays hold of it, according to the law of investigation, with an iron grasp. The senses act with indescribable keenness. By clear discrimination and careful analysis the character and divisions of the subject, and the method of studying it are soon discovered.

Thus the student prepares himself to master his subject. Without this preparatory work, he may study hard and worry long, but he will not become master of the situation.

If a lesson presents objects, qualities, actions, places, events, conditions, relations, or several of these, the student proceeds mainly by analysis, induction, comparison and contrast, or by several or all of these taken together, according to the elements contained in the lesson. By analysis we trace the objects, qualities, and places in geography. By induction we discover the general law governing a class of words in an exercise in grammar. By comparison and contrast we learn much about the conditions and relations in the problems of mathematics.

If a lesson present names, divisions, leading thoughts, principles, and definitions, or several of these, the student investigates them chiefly by analysis and synthesis, generalization and classification, induction or deduction. By analysis we distinguish the letters of a new word, and by synthesis we unite its elementary sounds in pronunciation. By analysis, also, we discover the divisions and the leading thoughts of a subject, and by synthesis we combine them all in an essay or an oration. By generalization we find names for classes of words and for kinds of external objects. By classification are worked out most of the long outlines in botany or zoology. By induction we may discover some of the principles underlying our investigations in the elements or physics. By deduction we apply the principles and definitions of logic or mental science to the discussion of particular topics belonging to these sciences.

In addition to these and similar modes of mental activity, there must be clear apprehension of what is studied; otherwise full comprehension is impossible. Processes and exercises must be thoroughly worked out, not only for the knowledge and mental development gained thereby, but also for the skill which the mind thus acquires in mastering difficult problems.

The law of continuance is applied to the principal parts of a given lesson first, and to the details afterwards. No thought of anything foreign to the lesson is allowed to break the continuity in study, until the whole lesson or a division of it be mastered.

The student who thus studies is exceedingly unpopular among time-killing

babblers. But he does not forget the requirements of the law of rest, according to his schedule. When an unusually difficult task requires much extra time, the student breaks the strain after close application of two to three hours, in order to avoid harmful fatigue at the end of the day. A short interval for rest will forestall exhaustion and enable him to regain some of the mental vigor required to complete his task well. A review by thorough repetition prepares the memory for perfect retention. Then only can association and suggestion bring the best results in recollection and reproduction before the teacher.

The student is now ready for the study of the next lesson upon the schedule. Only under unavoidable circumstances will he vary the order of studies. But when the time for rest comes, he is just as firm and determined to avoid all application of the mind to study, even though a part of a lesson be not learned before the time for reciting it has arrived. In this way only, can the teacher measure the power of a new class, in the shortest time, and assign lessons of proper length. The violation of the law of rest, together with other dissipations, has brought many a student's career to an untimely end.

From these considerations, it will be seen that, other things being equal, a student will be successful or unsuccessful in study, in proportion to the method he follows in applying the laws of study. It requires much wisdom and unusual will power to obey the laws of investigation, of continuance, and of rest, so as not to violate any one of them. Beginners are likely to find it difficult to apply the law of concentration. Indeed, some of them never become students, in the true sense, because they are unable to *fix* their minds upon the lesson before them. Others lack discriminative power and never go below the surface of any lesson, and cannot even concentrate their thoughts upon it, longer than a few minutes at a time. Those who are thus troubled should make critical analyses of short and easy topics their sheet-anchors, to hold them down to their work ; otherwise there is scarcely any hope of their carrying out the laws of investigation and continuance. Such students should also guard against studying books by the page instead of mastering subjects.

From methods of study in general we pass to particular methods for studying branches having certain peculiarities ; but want of space forbids giving more than a few practical hints.

In orthography and in elementary reading, the beginner should look at every letter in a word as sharply as the printer looks at his proof-sheet to discover errors or defective type. As long as a boy mistakes one letter for another, or omits or transfers a letter he can derive but little benefit from the drill in the class-room.

In history, subordinate events must be made to cluster around the principal events to which they belong, and the principal events should form the divisions of a chapter or period. Having thus outlined the subject, the learner is ready to fix the outline in his mind and to fill it out by frequent and careful repetition.

In the physical sciences the facts and phenomena are related more or less by coordination or subordination. This relation can best be exhibited to the eye for the purpose of study, in the form of outlines. Therefore, the student should study them by making outlines. In the

same manner, some time may be saved in studying the causes and the laws, after the facts and phenomena have been learned.

Nearly all study in mathematics below higher arithmetic should be inductive ; nearly all above it should be deductive. At first the student proceeds from processes to principles; afterwards he proceeds from definitions and axioms down to the solution of problems or the demonstration of theorems.

The arts require the careful training of the eye and the hand, as well as the exercise of judgment and taste. The imagination also plays an active part and requires development in one student and restraint in another.

In the languages, grammatical forms must be mastered first. Uncertainty here simply means failure further on. In a modern language there should be much practice of speaking according to a model, and further on in the course the peculiarities of construction should be verified by the laws of grammar. In the ancient languages the style of a new author must be compared with that of the last one read. A list of the new words may be made, and their meanings should be closely studied. As much as possible should be learned about the life and spirit of an author, from his writings and from other sources. In no foreign language should translations into such language ever be neglected, under any pretext whatever. The thorough study and practice of Latin, Greek, German, or French composition puts the true student into actual possession of a powerful engine with which he can outride a thousand times his duty-shirking competitors. Original productions in one's own language should be the result of long continued study of the subject-matter, followed by a logical outline under a suitable process of invention. Then the correct application of rhetorical style completes the production.

The abstruseness of the study of the laws of thought as exhibited in logic, and of the functions and relations of the faculties of the mind as laid down in psychology, places these studies at the top of the scale of things human. When the mind turns in upon its own operations, it has to do with that which will outlive the things of time and space ; and therefore it encounters new difficulties in study. Abstract thought now largely takes the place of concrete thought. All the power thus far gained in mental development and much of the knowledge acquired must now be used in the study of mind. If the study of man, whose power is limited, be difficult, much more must be the study of God, whose power is unlimited. Theology, therefore, reaches beyond human knowledge. Here a new element must be added, namely, faith. Where knowledge ends, faith begins and reaches out into eternity.

In laying down general laws of study, and tracing their application in methods of study, we have not established a "royal road" to learning; for knowledge is gained by hard work along the way and is not to be won at the end of an easy race. Thestudent is to construct a grand highway by his own efforts. In this plan we have only surveyed the route; he must build the road himself. He will also mark out numerous by-ways, leading through valleys of pleasure and over hills of learning, back to the grand highway, from which the view becomes more delightful, at every step and in all directions, because he is building heavenward.

PSYCHOLOGY—MEMORY.

H. N. Carver.

THE presentative form of the mental activity was defined as that form which gives us knowledge of the world as now present in space. It is the power which makes us acquainted with the spatial relations of things. The representative power, or memory as we may call it comprehensively, on the other hand gives us knowledge of the world in time, makes us acquainted with the time relations of things. In perception, the thing known is present in time; and can have no relations of succession, but only relations of otherness; that is, the object is known simply as other than myself and such objects as are different from it only in spatial ways. Even the attributes of the object stand as differing from one another in these spatial ways. Whenever the element of change, or succession, comes into the thought, it is the representative activity that is at work; and the commom definition of memory is sufficient,—it is the faculty which gives us knowledge of the past, which re-presents things once known in perception, or in any other way, even in memory itself, imagination, reasoning, etc.

The ultimate problem of the memory, how we remember, how much of the activity is physiological, how much psychical, and the nature of the relations between the two, cannot be discussed here; though some of the most interesting questions in psychology are connected with it.

There are three things implied in a complete act of memory,—retention, reproduction, and re-cognition. Of course, if the original presentation is not in some way retained, there can be no re-presentation; and the perfectness of the recognition depends upon the perfectness of the retention. No presentation is ever recalled, unless something in the conscious present is connected with the original presentation, or with some of its associated objects. Explain it as we may, the stream of thought must be regarded as unbroken, each segment as connected with every other segment. Undoubtedly, the simplest way to explain this, is from the physiological side; and memory apart from some form of body is probably unthinkable. However that may be, it seems certain, that if any one of the innumerable lines of experience be once broken, the break is absolute and the past is lost forever. These considerations give the clue to the significance of the laws of association in explaining the facts of memory. Things connected in our experience, either in space or time, have a tendency to recall one another into the representative consciousness.

And unless something thus connected either in likeness or unlikeness, is in some way brought into the present consciousness, nothing in the past is ever recalled. There must be something in the field of perception, some object now seen, or heard, or felt, and connected with the past experience by these laws of association, or there is no memory of the past. Even the phenomena of dreams, and reverie, and delirium

are not exceptions. Not only must there be this connection between the present and the past; the connection itself must be known as a connection, or there will be no perfect act of memory, there will be no re-cognition of the present consciousness as the re-presentation of the past experience.

No more formal statement of the laws of association seems desirable now; after a while, when we come to study the so-called elaborative faculty, we shall see that they are only the simple ways in which our intelligent life goes on in its process of building up the intelligible world in which we find all our interests.

It is sometimes conveniently said, that there are different kinds of memories; though they are more strictly stages in the development of memory, than real kinds, genetic, rather than generic. Accordingly, we may say there is a spontaneous and an intentional memory.

The past always lies as a more or less distinct background to the present; and in much the same way as a near object often spontaneously fixes the sight upon a distant one, which would otherwise be unseen, so an object, present for any reason in consciousness, fixes the inner eye upon some object in the backward line of the mental vision. In this way, when I meet a friend, any past associations are called up spontaneously, our last meeting, what we did, what we saw, talked about, etc., etc. I go along the street, some house meets my eye by mere accident, and a whole series of past experiences crowd upon me. Thus a large part of our every day life is made up. Often it runs to the extreme of pure dissipation, day-dreaming, reverie and on to certain forms of melancholy and insanity. The word phantasmis often applied to these extreme forms, as dreams, hallucinations, delirium, etc., though they are not essentially different from the simpler forms,—they are all the results of the working of the associative powers, when not guided by the reason and controlled by the will. This spontaneous memory, too, has much to do with acts that have become habitual or automatic, as a fluent speaker's choice of words, a musician's striking a certain key when his eye falls upon a certain written note, even a chicken's scratching, when its feet are placed upon a graveled walk.

The intentional memory, or recollection, on the other hand, is a far higher form of the activity. Here the present suggests something which is needful for the work now in progress, but which the spontaneous memory does not call up. The thing desired is recognized only as some integrant part of a connected whole, more or less completely mastered in its general features and obscure only in particular details. Some of the details are known clearly as connected in association with the desired part, and upon these the attention is fixed by the will. In this way, the lost part is tracked down and secured.

Still other kinds of memories are often spoken of. There is the memory of localities and direction, which enables a person to recall the topography of a place and keeps him from "getting lost"; the verbal memory, which enables one to commit words; the memory of names and faces; the scientific memory, or the memory of principles and laws, etc., etc. These forms are all valuable in their places, though they can hardly be more than mere stages in the general growth of the faculty. Savages and children have the lower forms;

the scientific develops only in individuals and communities of a relatively high order of development. Any unusual development in one direction, is apt to be attended by a deficiency in the others. A person whose work is largely mechanical, that is, whose work requires few movements and little attention, is likely to lose the power of remembering almost totally.

A word upon methods of improving the memory, and this article may close. And first, none of the patent methods should ever be resorted to. They will prove both vanity and vexation of spirit to the one who invests in them. Given good general intellectual power, and there is but one way to improve the memory, namely, to use it in the proper way. A poor memory usually is one that does not retain well, and power of retention depends chiefly upon the amount of interested attention given at the time the perception was made. If a person wishes to cultivate, for example, a memory for historical events, let him read some interesting history with the greatest care, and then find occasion to retell in his own words what he has read. Let the exercise be short at first, but be gradually extended until the substance of long narratives can be given. Whatever the special form may be, that is selected for cultivation, whether verbal, or mechanical, or historical, let it always be carried on toward the scientific and philosophic form, in which the associations are principles and laws. Any one who will use a little good judgment need have no occasion to invest his money in Prof. A's or Prof. B's great system of mnemonics.

THE TEACHER.

GEOGRAPHY. II.

MANTIE E. BALDWIN.

POLITICAL or descriptive geography should be studied always in connection with maps and map-drawing.

Children ought first to be made familiar with the geography of their own state. Suppose that state is Indiana. There are numerous ways in which the work may be presented. Much will depend upon the length of time that can be given to it. It is usually wise to spend much time and give many lessons upon the first state taken up, as after learning thoroughly how to study that, the pupils can take up the study of others readily and without so much help from the teacher.

It is assumed that previous drill has been given upon the meaning of the terms *latitude*, *longitude*, *equator*, *poles*, *city*, *river*, *state*, &c.

Upon the globe the Western Continent should be pointed out. On that continent North America should be found, and in North America the United States.

If there is, in the schoolroom, a wall map of the Western Continent, let pu-

pils find the United States upon that also. In the United States, the position of Indiana should be noticed. Whether it is in the southern or the northern part of the Western Continent; whether in the southern or the northern part of the United States; how far north of the equator; and in what zone. How far it is from the Atlantic Ocean; how far from the Pacific? How far from the Gulf of Mexico? How near to Lake Michigan? What state is its neighbor on the north? What on the east? On the south? On the west? What lines form its boundary? What rivers?

The next thing to be considered is the state itself. What is its shape? How many miles is it from north to south? How many from east to west? (These distances can be found by using the scale of miles given on the map.) What is its area as given in the book? Is it a large or a small state compared to other states?

What does the book say about its surface in general? Where is the land high? Where is the highest point? How high? Where is the land low? Where the lowest point? How low? What rivers? Where do they flow? How large? Of what use? What lakes? How large? Good for what? What kind of climate? What kind of soil? What is grown in the soil in the different parts of the state? Why should cranberries be in the northern part and melons in the southern? Where are the large forests? Trees of what size and kinds? Useful for what?What animals, birds, fishes, reptiles and insects are found? Why no large animals? What animals do farmers raise? What about bees, fowls, etc.? For what purposes are all these? What minerals? Where? Of what value and use? Where is the soil of which the fine tiles are made? The drain tiles? Pressed brick? Common brick? Where the building stone? What kinds? Of what value compared with building stone in other states? Where coal? What kind? Where oil? How obtained? Where gas? In what other occupations are the people of Indiana engaged besides these that have been mentioned? Building what? Where? Buying and selling what and to whom? How do they get these things? How send away what they make and sell? What is a railroad? Where are these railroads? Name the leading ones. From where to where do they extend? (Look on any common railroad map.)

What cities are in the state? where? What is the capital? Where? How large? Tell something of interest to be seen there. What is the next city in size? Where? For what noted? Tell of some important or interesting things connected with some of these cities.

What kind of schools in the state? How are the public schools paid for? What schools are there for advanced students? Where are these? What libraries? Where? By whom kept up? What are some of the principal newspapers published in the state? Magazines?

What about the churches? How kept up How is the state governed? Name the chief officers. What is the Capitol Building? Tell something about it.

When was the state first settled? Where? By what people? When was it made a state? Tell some of the events in its history. Name some persons eminent in its history.

Tell anything else of interest concerning the state. Wyandotte cave, and noted historical places should be mentioned, and, if possible, described. The excellence of the common school system and the state's great school fund

should be spoken of. The rank it now holds as a wheat producing state, and the value of its inexhaustible stone quarries should be told.

With beginners, only the most important facts should be dwelt upon. More advanced pupils might be required to carry out the work even more fully than is here indicated.

Adjoining states may be studied in a similar manner, and comparisons made as to their likeness and unlikeness to Indiana, in size, shape, products, &c. Then, groups of states, or sections, may be compared in a similar manner. For advanced pupils in geography, the following topic list would be found useful. It can be adapted to the study of a county, state, section, division, country, grand division, or a continent. Topics may be added to the list or omitted from it at the discretion of the teacher.

- I. POSITION
  - 1. With respect to Latitude and Longitude.
  - 2. With respect to adjacent divisions.
- II. EXTENT
  - 1. Definite.
    - *a.* Length and breadth in miles.
    - *b.* Area in square miles.
  - 2. Comparative.
- III. BOUNDARY
  - 1. North.
  - 2. East.
  - 3. South.
  - 4. West.
- IV. SURFACE
  - 1. Natural Features.
    - *a.* Mountains.
      - Systems, Ranges, Peaks.
      - Average Height.
      - General Direction.
    - *b.* Rivers.
      - Systems and Course.
      - Length, Size, and Area of Basin.
      - Availability
        - For Navigation.
        - For Water Power.
    - *c.* Lakes.
      - Elevation and Depth.
      - Area and Uses.
    - *d.* Valleys.
      - Extent and Location.
    - *e* Plains.
      - Elevation and Slope.
  - 2. Natural Curiosities, Picturesque Scenery, &c.
- V. SOIL
  - Where Productive?
  - Where Barren?
- VI. CLIMATE
  - 1. Seasons.
  - 2. Prevailing Winds.
  - 3. Rains.
- VII. NATURAL PRODUCTS
  - 1. Animal.
  - 2. Vegetable.
  - 3. Mineral.
- VIII. INDUSTRIES
  - 1. Agriculture.
    - What Produced?
    - Quantity and Value.
  - 2. Stock-raising.
    - Value.
    - Produce.
  - 3. Mining.
    - Extent.
    - Results.
  - 4. Lumbering.
  - 5. Hunting.
  - 6. Fishing.
  - 7. Manufactures.
    - What Made?
    - Extent.
    - Value.
  - 8. Inventions and Works of Art.
    - By Whom?
    - When?
  - 9. Commerce.
    - Exports.
      - Foreign.
      - Domestic.
    - Imports.
      - Foreign.
      - Domestic.

IX. PEOPLE
1. Number, and Number to the square mile.
2. Habits, Customs, and Character.
3. Nationality.
4. Celebrated Persons.

X. OVERNMENT
1. Form.
2. Power.

XI. RELIGIO
1. Sects.
2. Influence.

XII. EDUCATIONAL AFFAIRS
1. Schools
a. Common Schools.
b. Higher Institutions.
2. Public Libraries; also, Books and Papers Published.

XIII. CAPITAL AND CHIEF CITIES
1. Location.
2. Population.
3. Leading Characteristics.

XIV. HISTORY
1. When discovered or settled.
2. Where?
3. By Whom?
4. Interesting Events.

XV. MISCELLANEOUS.

Numerous review exercises on the map can be made valuable.

1. Start from New York City and go to San Francisco. Tell how you would go; on what railways, boats, &c. Name the states and territories through which you would pass. Describe what you would see in the cities and towns through which you would go. What would you see people doing in the various states? What growing in the fields? What natural curiosities could you visit on the way? What scenery? What kind of weather would you expect to find in the different sections? Warm or cold? Rainy or dry? How many miles from one important city to another? How many miles in the entire journey?

2. Return by a different route, and describe the trip in a similar manner.

3. Name the states producing iron, coal, petroleum, natural gas, marble, granite, limestone, sandstone, kaolin, slate, copper, silver, lead, salt. ice.

4. Locate the wheat regions of the United States. Of the world. Corn, rice, tea, coffee, spices, dates, cotton, wool, cashmere wool, silk.

5. Find on the map the diamond fields of the world. The forests producing mahogany, ebony, and other fine woods. The ivory regions.

6. Go around the world on the forty-first parallel of north latitude, and tell through what cities and countries you would pass, and what interesting things you would see.

7. Go from Reikiavik, Iceland, to Cape Horn, and tell through what you would pass, what climate, countries, cities, bodies of water, &c. How would you go? What animals and vegetation would you see? What people?

8. Where and what are llanos, prairies, steppes, tundras, monkeys, Eskimos, seals, Orkneys, Andes, Hudson, Labrador, Athens, Bermudas, Hoosiers, and oranges?

PRACTICAL AND CULTURE STUDIES.

ADDISON B. POLAND.

THE prevailing criticism upon our schools, such for instance as that made recently by President Eliot, alleges that the average results (ends) of our best schools are comparatively slight and of small worth. The fact that the teacher does not understand the child is doubtless to some extent responsible for poor results, but only partially; one of the chief difficulties is, as we have said, the deplorable ignorance of what is and what is not *worth* teaching. That is, we need to study the objective side as well as the subjective side of education, or the relative values of studies in view of the future needs of the pupil as well as the processes and laws of mental growth, *i. e.*, psychology. It would be a mistake, therefore, to establish in our colleges and universities chairs for the teaching of psychology and theoretical pedagogy, solely.

Instruction in applied pedagogy, looking to the formulation of precise and practical maxims, having a scientific basis and school-room application, is very much needed. What to teach of mathematics, history, etc., and how to teach for clearly defined ends are and must continue to be the most vital and important questions for pedagogical study. Hence, it is no exaggeration to affirm, with Spencer, that the chief need of our schools is some standard by which to measure educational values. This is a department of study and research that has been too much neglected. It is not sufficient to know, in a general way, that some studies, say for instance elementary arithmetic or language, have a practical value; while history and geography have a culture value mainly. This is not enough.

The distinction is an important one. Teachers should know the comparative values of studies and that, too, not as wholes merely, but of specific topics and classes of facts, how and to what extent valuable either as discipline or information. When President Eliot stood before a body of school-men such as greeted him last year at Worcester, and affirmed his conviction that it was a waste of time to teach the capitals and boundaries of the states of the Union, he was applauded. How could it be otherwise? Everybody admits that a great deal of useless rubbish is taught in all our schools. And what is the remedy? Surely no general condemnation of the practice has yet been adequate to stop it, so strong is the power of habit and tradition. The remedy must be found, if at all, in a better appreciation on the part of teachers of the relative values of subject matter for its practical, disciplinary, or culture ends. As a rule no effort is made in our elementary and higher schools to grade information according to any standard of relative values. All the topics of arithmetic, of history, and of geography are taught by most teachers as of equal or nearly equal importance. As a proof of this, witness the kind of questions generally called for upon examinations in our best schools and colleges; consider also the specific values attached to ques-

tions of various sorts. The absence of any just standard for determining relative values will be apparent everywhere.

This leads to the statement that when the broad distinction is made between studies that have a culture value mainly, and those that have a practical value merely, a sharply defined difference of method should be adopted in teaching. For example: whatever is needed for the uses of daily living should be so well and thoroughly learned that the processes, mental or physiological, should become automatic. We learn to walk, to move the arms and hands, to articulate, etc., so as to perform the normal acts automatically and without conscious effort. So the mental and physical processes of reading, and largely of writing, and of combining small numbers, etc. By frequent repetition all these acts become thoroughly mechanized, and the wise teacher will see to it that her instruction reaches the point where useful acts become fixed and invariable habits. The mistake is made when history and geography, which are essentially culture studies, are taught with the same end in view, to wit, the absolute fixing of this information by frequent repetition, so that it is reproduced with ease and certainty.

It was Voltaire, I believe, who said facetiously that all the geography a girl needed to know was "how to find the northeast bedroom," and all the chemistry, "how to make a kettle boil." We may be willing to extend Voltaires's categories of necessary information, but to treat all facts as of equal, or of anything like equal value, and to seek to reduce them to the automatic memory is the most common error in teaching. It exhibits a failure to estimate either the true ends of teaching or the relative values of different kinds of knowledge.

In general the method to be pursued in teaching practical studies, as distinguished from culture studies, may be broadly described as follows: the principle of the former should be that of repetition until certainty of automatic reproduction is secured. In all operations with the small numbers, in reading, spelling, etc., the end should be absolute memorizing—no half-way results; in other words, to mechanize the processes so completely as to relieve the mind from all conscious effort. Perfect and absolute memorization then, is the rule for practical studies.

But in culture studies, not so. Here the principle is that of unconscious absorption. For illustration: one may read a story by Scott or Dickens and unconsciously absorb the whole plot and development, and be profoundly and permanently impressed thereby, while having made no conscious effort to memorize any part of it. So all culture studies that have in view the enlargement of the intellectual horizon, the development of the sensibility, and the guidance and control of the will, should be studied upon the absorptive principle and never by forced memorizing, as though they were practical studies.

The carrying out of this principle would modify the teaching of geography, of history, and of literature to a remarkable extent. Instead of making the immediate end of such study the power to reproduce from memory certain facts, the aim should be rather to secure such a reaction upon the mind of the pupil as would enlarge the mental perspective, broaden the sympathies, strengthen the will, exalt the sentiments, and in general, conduce to the development of intelligence and character.—*Ed. Review.*

HINTS ON TEACHING PRIMARY READING. I.

W. H. BANTA.

WE teach reading by what, for the want of a better name, we have called the Vocabulary Method. It differs from the Word Method in that it involves many of the features of the Phonic and Synthetic Methods, and is closely allied to the Sentence Method. Before entering into details as to the method itself, we will state a few facts and indicate a general line of procedure.

Reading can only be well taught by a *live teacher* who is willing to work, and who is able to sympathize with the children, enter into their thoughts and feelings, and talk with them in their own language, using their own vocabulary. The successful teacher will not be hampered by fine-spun pedagogical theories or stilted methods, but will take the pupils where she finds them. She must become one of them in spirit and in language, in order that the work may be *naturally*, and hence effectively done. It follows, therefore, that the first thing to do is to become acquainted with the children. To talk with them, and ascertain the character and scope of their vocabulary; to gain their complete sympathy and regard. The child should talk with the same liberty, in the same tones, and with the same expression which he uses at home, or while engaged in play.

He must feel that the teacher is his friend. Otherwise it will be very difficult to awaken interest, and much more difficult to maintain it after it is awakened. There is a sense in which teacher and pupil must stand on the same plane. But in the truer and better sense, perhaps, the teacher must be able to walk on the same plane with the pupil, ever introducing and directing to new fields.

When these valuable relations between teacher and pupil shall have been fully established, and their mutual interest, sympathy, and friendship, are definitely understood, the work of teaching may properly begin. More failures in teaching are attributable to a mistaken idea as to the relation of pupil to teacher than to any other one thing.

The child of six years who enters school usually has a vocabulary ranging from five hundred to one thousand words. This is an ample stock from which to select such words as will be adapted to the *First Work in Reading*.

A part of the pupil's *talking* vocabulary must be changed into a *reading* vocabulary. The most familiar words should be selected. These words should be printed on the board. The teacher will use the particular word which she designs to teach, in conversation with the pupil calling his attention to it and at the same time pointing it out on the board, and telling the pupil that it is the same word he has just used in his *talk*. He will be delighted to find that the *reading* word is the same word he uses in talking. His first lessons are devot-

ed to this work of identifying words in the printed or written form. As soon as four or five words are learned, they must be combined so as to mean something, *i. e.*, make a simple statement. Let the pupil call them in the order in which you have arranged them, and he will be greatly surprised and pleased when he discovers that they *say* something. You then tell him that he is reading. If possible find the same statement on the chart or in the book and have him read it again. When the child has learned that the written or printed word is identical with the voice-word, the first great step has been taken in the wonderful work of learning to read. His interest is such that he will so master the printed and written forms that the word will always after be known at sight. (This statement is absolutely true of all pupils of ordinary capacity.) The work of mastering a small reading vocabulary will soon be accomplished. Care must be taken that the pupil gets the thought which he attempts to express. From the first, "Reading is getting the thought, as well as, expressing it." When the pupil has a reading vocabulary of fifty or a hundred words, he will be able to read many lessons and will, with proper direction, make many new sentences. With such a vocabulary he has a solid foundation upon which to build. He can be constantly employed, and readily taught to use his fingers. He will learn to write and will soon be able to write every word he has learned.

The work from the first should be thoroughly done. Every word presented for the reading vocabulary should be mastered. The pupil *must* be able to recognize the word instantly when presented to him, whether it be in print or in script. *Do not be in a hurry!* but never let your enthusiasm slacken for a moment. As you *do* and *feel*, so will the children *do* and *feel*, if you are a good teacher. Do not stop to teach the letters or spelling, because if you do so you will distract attention and waken intellectual activity.

Avoid, as nearly as may be, everything mechanical except the use of the pencil or pen-holder, or the handling of objects for "busy work." Everything, (like the pupil,) must be "full of life." All this applies to the *irst stage* in the process.

SOME LESSONS IN DRAWING. VI.

Perspective Drawing.

G. W. FERGUSON.

A GOOD model for this lesson might be constructed, thus: a small piece of board a foot square, or even smaller, will do for the foot; to the center of this fasten an upright piece of wood, 1 inch square will do, a yard long and in the top of this drive a nail leaving about half of it exposed. A stick a yard long for model No. 1 in which holes should be bored so as to form various angles with its edge, say one at 90°, one at 60°, one at 30° &c. and the model will have been completed.

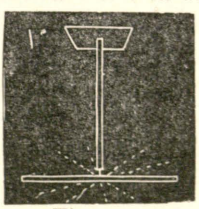


Fig. 1.

The standard might now be placed about ten feet from the observer with the model resting upon it so as to form an angle of 90° with the upright. It should be in a horizontal position and at right angles with the line passing from the eye to the model so that when a line has been drawn parallel to the model, it will also be parallel to the top and bottom of book. The model should now be turned a few inches at a time and, as stated in last lesson, the eye should be fixed on the model, and a line drawn upon the paper parallel to it. Several lines should be drawn for each position of the model.

The accuracy of the line should now be tested by every available means. Might hold one pencil so as to appear parallel to the model and another in a horizontal position, then notice the angle formed by the meeting of the pencils: compare this with the drawing.

A folding pocket rule will be found to be very convenient for the purpose of getting the angles formed by the meeting of two lines.

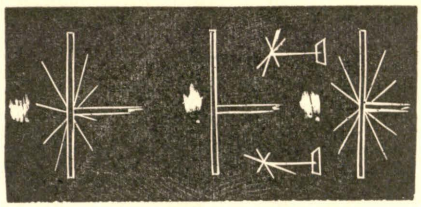
Horizontal and vertical lines are the standards. All straight lines should be compared with these when the slope is to be determined.

Move the model a few inches farther, sketch, compare, measure and correct if necessary. Move a few inches and sketch, &c., until the model is once more in the original position.

Now, what else has the pupil noticed?

First, that every position the stick was placed in, excepting the first, was horizontal, and receding.

Second, that these lines all appeared to slope upward.



The model might now be placed above the level of the eye, and sketched in the various positions as before.

What will the pupil now have noticed?

First, that the lines were receding horizontals, in reality.

Second, that they appeared to slope downward.

The model might now be placed on the level of the eye, turned in various positions, sketched, and what now?

First, he will have discovered that they are all horizontal lines and parallel to top and bottom of book.

Why do they appear thus? Because the horizontal plane on the level of the eye is viewed edgewise, and so long as the stick moves in this plane it appears horizontal. When it runs directly away from the eye, only the end is visible, and it appears as the central visual ray—C. V. R.

The model might in turn be placed so as to form different angles with the upright, moved into different positions, sketched, examined, corrected, &c. This practice should be kept up until it is easy to draw straight lines parallel to those about the room and elsewhere; also, imagine lines connecting various points, about the room, and draw lines on the same slope. The pupil will now be ready to measure lines, compare their lengths, &c.

How shall we do this?

Shall we measure by means of mechanical aids, ruler, pencil, string, etc.,

before sketching and measuring with the eye alone? Emphatically, no. Lines should never be measured or tested in any way except by the eye, until after the sketch has been made. What are we striving for, is it mere mechanical work? By no means: the sole purpose now should be to train the eye to see and measure lines and spaces, &c. The hand is supposed to be already trained to move freely along any line the eye sees, so the only obstruction now between the pupil and sketching solid objects is the measurement of lines and spaces.

The model might now be placed in a horizontal position, on the level of the eye, and, for convenience sake, we will place a second and similar model directly under it on the same nail on top of standard. Make lower model stationary. The line from the eye of the observer should form right angles with the model. The two sticks being of the same length, we will allow No. 1 to rest lengthwise on top of No. 2. Draw a line of any length, let it represent the length of model; next, turn model until only the end can be seen. This can be represented by placing a dot on the center of the line.

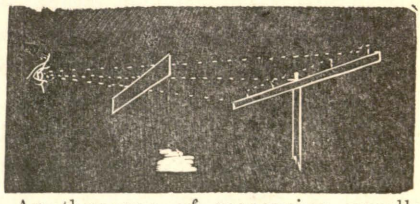
The model should now be turned a little, and it will be seen that it grows longer in appearance. Now judge, with the guidance of the eye alone, as to the length of the left end of model No. 1, or upper model, for instance, as compared with the left end of model No 2. The pupil should now ask himself these questions.

Is No. 1, one-half, one-third, or one-fourth the length of No. 2, or lower model?

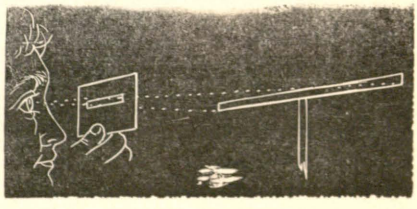
If the foregoing lessons have been put into practice the eye ought to be trained to bisect, trisect, &c., any line or space with quite a degree of accuracy, and it ought to be very easy to compare the lengths of lines, or lines and spaces, &c.

Turn the model farther, sketch again, turn model and sketch again, until the two models appear of the same length. This exercise should be mastered before leaving it to take up something more difficult.

To criticise the sketch, hold a rule or stiff piece of paper at arm's length and parallel to the model, imagine threads drawn from center and ends of model to the eye, place a dot where each appears to cut the edge of the paper. The head and paper should be kept quiet and in the same positions while taking measurements.



Another way of measuring parallel lines, very similar to the one just described, is to make an aperture in a piece of paper, say about a quarter of an inch wide and three inches long, it might be smaller or larger for convenience, hold this in a horizontal position, look through the opening, move the paper closer or farther from the eye until the ends of the model appear to just touch the paper at each end of opening; now place dots where other lines appear to cut the edge of paper.



A plane ground back of model is desirable, because there will be less confusion with other lines.

The model should now be placed a few inches below the level of the eye and the plane through which the model will now move will not be seen edgewise, as we are looking down on top of it and when the model is moved around, it will not appear parallel to No. 2.

Place the model in the original position, represent it as before with a line of any length, so long as we have no other line to compare it with, bisect it, and since we know that the model is fastened at the center of No. 2, a line representing No. 1, must pass through this point. First,—get slope of line, regardless of length.

Second, — imagine a vertical line dropped from end of No. 1 to No. 2. Third—What part of the left end of No. 2 is the part that the vertical line cuts off?

Sketch it, hold up paper straight edge and on it place dots where lines from extremities of No. 2 appear to cut it, also where vertical line appears to cut it, and you have exact measurements.

We get measurements on horizontal first, and now as the slope of No. 1 has been determined and drawn, we cut it off at the right place by drawing a vertical line through the corresponding point where vertical line appeared to cut No. 2.

Turn model, try it again and again in different positions, measure and correct if necessary.

Place model farther below the eye and sketch as before.

Place at different distances above the eye and sketch it as though it were your only chance and you had no means by which to determine the relative lengths, other than the eye.

Never allow yourself to carelessly jot down anything and depend on the ruler to measure it, or eraser to rub it out, so as to change it; better by far never see a ruler, or know of such a thing as an eraser.

ARITHMETIC. VIII.

Compound Numbers.

H. B. Brown.

IN this as in all the other subjects given by the writer, the elementary work is omitted as it is discussed by another writer for The Student.

Were we to ask the question, "With which subject in Compound Numbers should we begin?" the universal answer would be, Dry Measure. Yet the same teacher urges that we shall reason from the *known* to the *unknown*.

In dry measure we deal with "capacity", and thus far this subject has not been discussed, hence the reasoning is from the *unknown* to the *known*. The difficulty is the subject of dry measure comes first in most of the arithmetics, hence is taught without any thought of the relations of numbers. The learner need think but for a moment to see that the first topic is linear meas-

ure, or measures of lengths. The French understood this in developing the metric system. After measures of lengths, comes square measure. This deals with surfaces, or length and breadth. Then cubic measure, or measures of capacity. After this subject, any other may be discussed. There is no special order, excepting that Time and circular measure, not dealing with any of the others, should be considered last.

The ordinary method of solution of problems in compound numbers, we think faulty. For example, suppose we have the problem,—

In 3 mi. 2 fur. 20 rds. how many rods? Such a problem is usually solved as follows:

3 mi. 2 fur. 20 rd.
8

24 fur.
2 "

26 "
40

1040 rds.
20 "

1060 "

The process is 8 times 3 mi. which ought to give 24 mi., called furlongs, the 2 furlongs added to what according to the multiplication is miles and the result is called 26 furlongs. Again 40 times what is called furlongs gives rods. Any one can see the fallacy of such a solution. It might do well enough after the child understands the entire subject, but to the beginner it certainly is wrong.

Let us see what the real solution is.

1. 1 mi. = 8 fur. The sign = here really means equivalent to.

2. 3 mi. = 3 times 8 fur. = 24 fur.

3. 24 fur + 2 fur. = 26 fur.

4. 1 fur. = 40 rds.

5. 26 fur. = 26 × 40 rds. = 1040 rds.

6. 1040 rds. + 20 rds. = 1060 rds.

∴ In 3 mi. 2 fur. 20 rds. there are 1060 rds.

The mental operations in this are just such as naturally come to the child, if its mind is not perverted. Every result is in the proper denomination, so that the final result must be correct.

The sign (×) is read *times* and not *multiplied by*. The objection urged against this is that it is too long. It must be remembered, however, that when the pupil understands one problem thus solved, he understands the whole of *Reduction Descending*. After the subject is *thoroughly* understood, then the problems may be solved in the shortest possible way. What is desired is that the child be able to give a reason for every step as it advances; then it will not be obliged to go over the same thing term after term.

Reduce 585 pints to bu.

1. 2 pts. = 1 qt.

2. 1 pt. = ½ qt.

3. 585 pts. = 585 × ½ qt. = $\frac{585}{2}$ qts. = 292½ qts. or 292 qts. 1 pt.

4. 8 qts. = 1 pk.

5. 1 qt. = ⅛ pk.

6. 292 qts. = 282 × ⅛ pks. = $\frac{292}{8}$ pk. = $36\frac{4}{8}$ pks. = 26 pks. 4 qts.

7. 4 pk. = 1 bu.

8. 1 pk. = ¼ bu.

9. 36 pks. = 36 × ¼ bu. = $\frac{36}{4}$ bu. = 9 bu.

∴ In 585 pts. there are 9 bu. 4 qts. 1 pt.

This problem illustrates Reduction Ascending. In changing from one table to another the principles of Reduction Ascending and Reduction Descending are combined.

In 30 lb. Troy, how many lbs. Avoirdupois?

1. 1 lb. Troy = 5760 gr.

2. 30 lb. Troy = 30 × 5760 gr. = 172800 gr.

3. 7000 gr. = 1 lb. Avoir.

4. 1 gr. = $\frac{1}{7000}$ lb. Avoir.

5. 172800 gr. = 172800 × $\frac{1}{7000}$ lb. Avoir. = $\frac{172800}{7000}$ lb. Avoir. = $24\frac{24}{35}$ lb. Avoir.

∴ In 30 lbs. Troy there are $24\frac{24}{35}$ lb. Avoir.

It would be impossible to give a model problem under each table, and in fact, it would be wholly unnecessary. Multiplying problems would make the subject no clearer.

One problem in square measure and one in cubic measure will be given, because they will aid in illustrating Square and Cube Root.

How many sq. ft. in a board 15 ft. long and 3 ft. wide?

From the principles in multiplication, 1st. The product must always be of the same kind as the multiplicand, and 2d, The multiplier must be an abstract number, it will not do to multiply 15 ft. by 3 ft. and call the result sq. ft.

In order to understand a problem of this kind, the learner must know that a table cannot be formed without having a *unit of measure*. In Troy weight, the grain is the unit of measure; in Time measure the second is the unit of measure. In short, a table cannot be made without a unit of measure; consequently there must be some unit in square measure. Let us, then, assume that a surface 1 ft. long and 1 ft. wide, which equals one square foot, be the unit of measure in Square measure. Any basis might be taken, but some unit must be taken, and for our problem, the above is the most convenient. Then,

1. A surface 1 ft. long and 1 ft. wide = 1 sq. ft.

2. A surface 15 ft. long and 1 ft. wide = 15 × 1 sq. ft. = 15 sq. ft.

3. A surface 15 ft. long and 3 ft. wide = 3 × 15 sq. ft. = 45 sq. ft.

∴ In a board 15 ft. long and 3 ft. wide there are 45 sq. ft.

It will be said by some that in the first equation feet are multiplied by feet. Let such persons suggest some unit of measure, and by means of it, we can build up a table that can solve the problem.

The same is true of cubic measure.

In a solid 8 ft. long, 6 ft. wide, and 5 ft. thick, how many cu. ft.?

1. A solid 1 ft. long, 1 ft. wide, 1 ft. thick = 1 cu. ft.

2. A solid 8 ft. long, 1 ft. wide, 1 ft. thick = 8 × 1 cu. ft. = 8 cu. ft.

3. A solid 8 ft. long, 6 ft. wide. 1 ft. thick = 6 × 8 cu. ft. = 48 cu. ft.

4. A solid 8 ft. long, 6 ft. wide, 5 ft. thick = 5 × 48 cu. ft. = 240 cu. ft.

∴ In a solid 8 ft. long, 6 ft. wide, 5 ft. thick, there are 240 cu. ft.

THE COOLING OF THE SUN.

ALEXANDER WINCHELL.

THE sun affords us thirty-nine fortieths of all the warmth which we enjoy, and we feel quite unconcerned about the alleged slow cooling of the earth. To the sun we owe the numberless activities of the organic and inor-

ganic worlds, and we feel quite independent of the waning temperature of this dying ember which we call the earth.

The amount of heat dispensed by our solar orb is truly something the contemplation of which overpowers the imagination. The rays which fall upon a common burning glass, converged to a focus, speedily ignite a piece of wood. The heat which is received by a space of ten yards square is sufficient as to drive a nine horse power engine. The total amount of heat received annually by the earth would melt a layer of ice one hundred feet thick. As the solar heat is radiated equally in all directions, it is easily calculated that the total emission of heat from the sun is 2,300 millions of times the whole amount which reaches our earth.

Such an enormous expenditure of heat is sufficient to reduce the temperature of the sun two and one-fifth degrees annually. During the human period of 6,000 years, the temperature would have been reduced more than 19,000 degrees. At such a rate of cooling it is obvious that the sun must speedily cease to warm our planet sufficiently to sustain vegetable and animal life. But it is certain that the sun's high temperature has been maintained during almost countless ages anterior to the commencement of the human era. Those titanic reptiles which could luxuriate only under tropical warmth flourished a hundred thousand years before the world was prepared for man ; and those rank, umbrageous ferns, whose forms we trace upon the roof-shales of a coal mine, existed before the reptile horde, and purified the air for their respiration.

What unseen cause has perpetuated, for a million of years, those solar fires? Kepler asserted that the firmament is as full of comets as the sea is of fishes, and Newton conjectured that these comets are the fuel carriers of the sun. Alas ! we only know that the wandering comet, though flying in tantalizing proximity to the sun, but accelerates its speed and hurries onward, as virtue hastens past the vortex of ruin. Is it a chemical action which maintains the solar heat? The most efficient chemical action for this purpose is combustion. Now, if the sun were a solid mass of coal, its combustion would only suffice for the brief space of forty-six centuries to replenish the solar system with its vivifying influence. Is it the effect of the sun's rotation on his axis ? such rotation could generate no heat without the resistance of another body. Even if that other body were present, a calculation based upon the sun's mass and his rate of rotation shows that the heat generated could only supply the expenditure for the space of one hundred and eighty-three years.

There exists, nevertheless, a means of recuperation to the solar energy. It is not an exhaustless resource, but it prolongs materially the period of the sun's activity. Though no comet has been *known* to fall into the sun, it is now generally admitted that cosmical matter is raining down upon the sun from every direction.

Besides the planetary and cometary bodies which revolve about the sun, it is now demonstrated that the interplanetary spaces are occupied by smaller masses of matter, from the size of a meteorite to particles of cosmical dust. These all are flowing about the sun in a circling stream, but forever approaching nearer and nearer, until they are gradually drawn into the solar fires.

The showers of meteoric hail which pelt our earth at certain periods of the year are merely cosmical bodies that have been diverted from their path in certain parts of her orbit. That faint cone of light which streams upward from the setting or the rising sun, near the time of the equinoxes, is but a zone of planetary dust illuminated by the sun's rays —a shower of matter descending upon the solar orb, and rendered visible to us, like the rain sent down from a summer cloud and projected upon the clear heavens beyond.

Arrested motion becomes heat. The blacksmith's hammer warms the cold iron. A meteorite falling through the earth's atmosphere develops so much friction as to generate heat sufficient to dissipate the body into vapor. One of these cosmical bodies falling upon the sun must, by the concussion, produce about 7,000 times as much heat as would be generated by an equal mass of coal. It is thus that the enormously high temperature of our sun is maintained.

But the very mention of this source of recuperation of exhausted solar energy suggests a limit to the process. For how many ages can the cosmical matter within the limits of the solar system be rained down upon the sun without complete exhaustion? The space inclosed by the orbit of Neptune is not infinite. The supply of cosmical matter is but a finite quantity. Time enough will drain the bounds of the solar system of all its wandering particles of planetary dust. What then will be the fate of the sun?

The conviction cannot be resisted that the processes going forward before our eyes aim directly at the final extinction of the solar fire. Helmholtz says: "The inexorable laws of mechanics show that the store of heat in the sun must be finally exhausted." What a conception overshadows and overpowers the mind! We are forced to contemplate the slow waning of that beneficent orb whose vivid light and cheering warmth animate and vivify the circuit of the solar system. For ages past unbounded gifts have been wasted through all the expanding fields of space—wasted, I say, since less than half a billionth of his rays have fallen upon our planet. The treasury of life and motion from age to age is running lower and lower. The great sun which, stricken with the pangs of dissolution, has bravely looked down with steady and undimned eye upon our earth ever since organization first bloomed upon it, is nevertheless a dying existence. The pelting rain of cosmical matter descending upon his surface can only retard, for a limited time, the encroachments of the mortal rigors, as friction may perpetuate, for a few brief moments, the vital warmth of a dying man.

Methodist.

THE SCHOOLS OF CALIFORNIA.

H. CLAY FABER, A. B.

IT is the undisputed claim of the Californians, that the "Golden State" has the best schools "between the two oceans." Nor is this a vain boast, for the system of education that obtains in our state has essential features whose

superiority cannot be gainsaid. Pre-eminent among these are excellent laws, an abundant supply of money for the maintenance of public schools, uncommonly rigid examinations of applicants for certificates, and a spirit of progressiveness that keeps the ambitious teacher fully abreast with the most advanced thinkers in the realm of didactics. The logical sequence of efficient school laws, liberal appropriation for educational purposes, severe tests of proficiency, and progressive ideas, is admirable organization, good salaries, competent and enthusiastic teachers.

The triple question of salaries, examination, and the prospect of securing good positions as teachers, may be of paramount interest to those readers of THE STUDENT who may have turned their eyes to the beautiful Sunset Coast. Hence a succinct discussion of the first-named phase of the question of public schools in California, shall form the scope of this article.

California has more wealth in proportion to its population than any other state in the Union, and the teacher is not forgotten in the distribution of her native gold. During the year ending June 30, 1891, there were employed in the schools of San Francisco 859 teachers, 65 males and 794 females. Four of these received $250, the maximum monthly salary, and five received $40, the minimum. Of the latter some were assistants from the post graduate class and some, teachers of sewing. The average monthly salary was $81.41; average paid male teachers $129.36, females, $77.41. Twelve months constitute the school year. Los Angeles, a city whose population exceeds 50,000, during the same period, gave employment to 178 teachers, whose average yearly salary was $823.65, and the monthly salary, $91.52. Pasadena, the most aristocratic as well as the most picturesque city of southern California, had in its public schools, the past year, 1072 children, taught by 34 teachers, whose salaries ranged from $675 to $2,000. The average monthly salary was $91.50. Santa Cruz, one of the favorite summer resorts of the state, where salubrious climate and cheap living are important items from a teacher's standpoint, pays her teachers an average monthly salary of $68.55. The monthly average of the male teachers' for the current year is $116.25. San Mateo county, one of the smallest counties in the state, has excellent schools and pays its teachers well. The average salary paid is $64.

Tulare county occupies a conspicuous place in the educational affairs, in the upper San Joaquin valley. Elegant school houses are the pride of our people in city and country; and worthy teachers are highly appreciated and handsomely paid. The highest salary paid in the county is $150 per month of twenty days; and the fortunate recipient is the writer of this article. The lowest salary is $60 per month, and is paid to an obscure pedagogue in a remote mountain district, where pupils are few and personal expenses insignificant.

Other cities might be enumerated, but as the salaries of teachers in cities of equal population are substantially the same, the interest of this article would not be promoted nor its value enhanced by a multiplication of statistics.

THE ZURCHER UNIVERSITY. II.

G. H. Frommholz.

WE called ourselves lucky to have found out so much during the day. We were punctually there next day at 4 o'clock, but the room was empty and no professor to be seen. He had changed his hours, we learned afterwards. However we succeeded in getting hold of Prof. Stein within two weeks, it took me four weeks and all my obstinacy to have the pleasure of listening to Prof. Van Wyss. I told the Pedell once what comfort it would be to a stranger to find a program somewhere announcing the time and place for all lectures; he conceded, but I do not doubt that all is as of yore.

At last Friday morning had arrived, when the Senate were to pass judgment on me. The Senate!! Of course I put on my best garments and an extra ribbon besides. We called first on the Pedell, who ushered us into the anti-chamber where we found other students waiting. The silence was only broken by the chattering of my friend and me. One after the other of the students were called out into the other room never to appear again. Then once more the head of the Pedell appeared and I was summoned. Entering a spacious apartment he led me to a thick, large volume to write my name. Then I was told to sit down. It was my first chance for a close examination of the room. The center was occupied by a large table at which perhaps more than a dozen students were sitting. At the other end I recognize the figure of the Director who was busily writing. After the last of the students had entered the Director rose, every student following his example. He gave us a short address, and then announced that we should shake hands with him as a promise that we were going to abide the laws of this institution, which I expect in this case meant—no duelling and no rows with the police. Then we were dismissed. But where—where was the Senate. If the Director was not the Senate, I have not seen it. Whether every student must go through these ordeals, I do not know. I was a few days behind time; probably there are still more ceremonies at the grand opening. They are anyhow not calculated to save the time of the student.

We were then told to go to the Canton building, at least ½ mile distant, to deposit our matriculation fee of 20 frs. ($5.00). Returning with the certificate we received for it in return a certificate of matriculation, quite an elaborate affair, and a blank book with the laws of the University and blanks for the registration of the lecture courses, that one may elect, and the signature of the corresponding professors. Then we returned to the Canton building to register for our lecture courses and pay for them. Each lecture course has its own price. For one of the lecture courses I registered with 5 lectures a week, I paid $4.00, another with two lectures a week, about $3.00. Chemistry during one term costs $20.00. The tuition paid at these universities is in consequence thereof no definite sum. The professors announced their lectures ac-

cording to their pleasure, and are not compelled to deliver them unless 3 students have registered for them. I had the pleasure to elect 3 or 4 of the courses (accidentally) which were not delivered.

There were more than 500 students at Zurich that semester, but as the number of professors is large and there are no definite classes, the audience with one exception did not number 40, but usually was much below that number. There being no classes in our sense of the word, there is also no class spirit and seemingly nothing known of classmates. I learned by and by to recognize some faces but I never learned the name of any one whom I used to meet at these lectures. That seemed to be the usual way, although it may be partly my fault, as I did not feel like offering a portion of my limited time at Zurich at the shrine of social pleasure. We were not conscious of any rules or regulations but the order was always faultless. Each one attended during the lecture to his business while uninterruptedly would sound forth the voice of the professor. No good morning, no quizzes, no questions, no roll: the professor puts down his hat, and "My gentlemen," yes, sometimes, "and my ladies", would be added One of the professors regularly left the addition of the last part to me; there were a dozen ladies in his lecture and my pride could not endure it to be so continually slighted.

Lectures begin very early. I had an ambition to get a sample of each lecture course, but when I found out that one lecture began at 6 o'clock, A. M., about 3 miles away from the University, I had to yield; it was nearly more now than I could stand to be ready at 7-10 A. M. The lectures end at 6 o'clock P. M. Besides the University Building proper, lectures are delivered in the Botanical garden, in the Observatory, Physiological, Physical, Pathological, Anatomical and Hygienic Laboratories, in the hospitals, all separate buildings, and in the Insane Asylum, a good ways from the noise of the city. It takes necessarily some time until a stranger is acquainted with this complexity of buildings, and with the city itself. However, after some weeks I had gained this acquaintance. I enjoyed my lectures very much. Two of my professors were very fine in their delivery as well as knowledge of the subject. Some of the professors however were so poor in their delivery that I would not have listened to them if the yet unknown wisdom of Solomon had come from their lips.

The semester scarcely lasts longer than 3 months when the professors give their signature, and the Pedell, upon another payment of 60 cts., makes out the certificate of attendance. No examinations until the student becomes a candidate for some degree.

As for my own taste, I prefer the easy free going way that I have found at Valparaiso and other places, where I studied. The straight-jacket system that I met to some extent last year was quite abominable to me. There necessarily must come at some time in the life of the individual a period when he assumes the full responsibility of his own actions. In the life of the German student the period is coincident with his matriculation at the university. For better or worse he is his own master. As to the amount of diligence of the German student, I well know that there are a good many, that earnestly improve every opportunity offered, but I am inclined to think that the American student, is not

only more enthusiastic about his studies, but also more studious. While the latter spends a good many evenings at his books the former sits in the "Kneipe" and with beer and song prepares his brain for the next day's work and the coolness of the social life in the university is overcome by the glow of friendship between the "Kneipe bruder and frats." Many a hard saved and earned dollar, earned not by the student but by the parent, goes down the throat; many a precious hour is squandered, and worse than that, many a character is ruined in these Kneipes.

SIGMA PI MATHEMATICAL ASSOCIATION.

THE MATHEMATICIAN.

W. J. Hussey.

THE mathematician whose chosen work lies in the domain of pure mathematics has a singular fondness for expressing the results of his labor in symbolical forms. When expressed in this way the results are, as a rule, unintelligible to all save the narrow circle of investigators who are working in the same field. To him and to them these symbolical results and the theorems which they embody are charmingly interesting. If his methods of investigation are flawless, they are logical consequences of the assumptions upon which he has founded them. They establish nothing which is not implicitly contained in the assumptions.

These assumptions may be divided into two classes; those which agree with what experience teaches as being true and those which are not based on experience, but are purely fanciful. We shall consider a few results arising from these two classes of assumptions.

When the assumptions of the mathematician are those which experience teaches as being true, his results also are those which agree with experience and they may be of value by reason of the practical uses which may be made of them. This is especially true of such branches of mathematics as algebra, geometry, calculus and mechanics, all of which are founded upon assumptions (axioms and principles), universally recognized as true, and all of which furnish numerous results having applications of the most practical character. So quietly are these applications made that the world in general loses sight of them and entirely underrates their practical importance. Not seeing immediate applications, it concludes that all branches of mathematics except the simplest elements of arithmetic are useless. Such conclusions are formed by persons whose knowledge of mathematical science and of the relations which it sustains to other sciences and to practical affairs, is exceedingly imperfect. Such conclusions are entirely unwarranted and ought not for a moment to be entertained.

Machinery shapes a multitude of things. Many of the necessities and conveniences of daily life are its products, and without it the cost of many of these would be altogether beyond

our means. The mechanical engineer designed the machinery, this he could not have done without a knowledge of mathematics and mechanics.

The land is crossed in every direction by roads of steel. Smooth tracks, swift locomotives and comfortable cars make travel easy and enjoyable; strong and commodious cars make it possible for cities, no matter how widely separated they may be, to carry on gigantic commercial transactions. All along these lines of steel the mathematician has been at work. He has located the roads across the plains and through the mountains; he has determined their grades; he has rounded their curves; he has arched their tunnels with masonry, strong enough to support the earth and rock above them; he has weighed the trains and their loads and designed the bridges to support them, having carefully arranged all the parts and computed their sizes in order that they may safely carry the stresses imposed upon them. Surely the mathematician has here been of use.

But this is not all that he has done. The trains glide along the tracks with great speed and are ever meeting and passing each other. This they do with such great precision that accidents are comparatively few—so few in fact, that on the average only one passenger out of a million and a half loses his life. This precision is due to their being controlled by a clock at some central station. But who controls that clock? Who, with entire confidence that his statements are true, can say that the time it indicates is correct? To this there is but one answer— the mathematician who has applied to the principles of his science to astronomy. Astronomers, by their patient and laborious investigations, based on a multitude of the most refined observations, have learned the motions of the heavenly bodies with such accuracy that they are able to predict the positions these bodies will occupy in the sky for many years to come. They have prepared tables of these motions which give the positions which the sun, moon, planets and principal stars will occupy at given times. And by means of these tables they can, among other things, determine the time by observing that a given body is in a given position. By observing a number of stars, four, five, six or more, and combining the results, the astronomer is able to determine the time to within much less than a tenth of a second. He can do nearly as well by observing the sun but, in his fixed observatory, he always uses the stars because the observations are more easily made, more easily reduced and the results are more accurate. Thus, by astronomical observation, the time may be determined and in no other way can it be accurately determined. Consequently, the railways and all who use accurate time must ultimately depend upon the astronomer for it, that is, they must depend upon the mathematician for it.

(*Continued next month.*)

This is one of the most interesting departments of THE STUDENT, and it is only made so by the co-operation of its readers. Let us all feel free to send in any queries or any correspondence that may be of interest to the Association. Send all your communications to THE STUDENT, Valparaiso, Ind.

QUERIES.

23. A tree 100 feet high stands in water 10 feet deep; in breaking, the top part enters the water 20 feet from the perpendicular part. Find the length of the two parts of the tree.

L. M. N.

24. A tree 100 feet high stands on the side of a hill. It breaks and the top strikes 35 feet down the hill; and, if a line be drawn at right angles from the base of the stump to the part broken off, it will be 20 feet long. Find the part broken off.

J. E. L.

25. A bridge is 10 feet long; over it is an arc; from the center of the bridge to the center of the arc is 3 feet. What is the length of the arc?

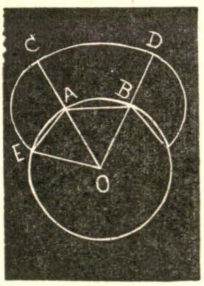
M. M. YEWELL.

ANSWERS.

19. The values are indeterminate because all the equations are dependent, *i. e.*, each one is dependent upon or may de derived from the other two.

There is no other way of determining that there are but two independent equations, than by showing that one is derivable by means of the other two.

20. Solution I.—In this solution the 20 feet given as the width of the gap, also the 25 feet, the portion of the rope beyond the gap, are considered as chords of the circle.

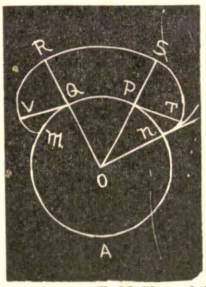


Let O represent the center of the circle, A and B the points at each side of the gap, C and D the points 100 feet from the center on the same right lines with A and B respectively. And let E represent the point 25 feet from A where the horse touches the circle on the outside.

1. Then, sin ½ A O B = $\frac{10}{75}$ = .133333
2. ∴ ½ A O B = 7 degrees 39 minutes 44 seconds.
3. A O B = 15 deg. 19 min. 28 sec.
4. Sector O C D = $\frac{15 \text{ deg. } 19 \text{ min. } 28 \text{ sec.}}{360 \text{ deg.}} \times 3.1416 \times 100^2$
5. Sector O C D = $\frac{55168}{1296000} \times 3.1416 \times 10{,}000$ = 1337.31
6. Circle O E A B = 3.1416×75^2 = 17671.5
7. Sector O A B = $\frac{55168}{1296000}$ of 17671.5 = 752.24
8. Large sector — small sector = 1337.31 — 752.24 = 585.07
9. Sin ½ A O E = $\frac{25}{75}$ = .166667
10. ½ A O E = 9 deg. 35 min. 39 sec.
11. A O E = 19 deg. 11 min. 18 sec.
12. Sector O E A = $\frac{19 \text{ deg. } 11 \text{ min. } 18 \text{ sec.}}{360 \text{ deg.}} \times 17671.5 = 941.91$
13. Triangle O E A = $12.5 \times 73.95 = 924.37$
14. Sector—Triangle = 941.91 — 924.37 = 17.54
15. O A E = 90 deg. — 9 deg. 35 min. 39 sec. = 80 deg 24 min. 21 sec.
16. E A C = 180 deg. — 80 deg. 24 min. 21 sec. = 99 deg. 35 min. 39 sec.
17. Sector E A C = $\frac{99 \text{ deg. } 35 \text{ min. } 39 \text{ sec.}}{360 \text{ deg.}} \times 3.1416 \times 25^2 = 543.20$
18. 543.20 — 17.54 = 525 66
19. $525.66 \times 2 = 1051.32$
20. 17671.5 + 1051.32 + 585.07 = 19307.89 sq. ft., required area.

Σ. F. O'Riordan.

Solution II.—It is here taken that the 20 feet given as the width of the gap, Q P, and the 25 feet, the portion of the rope beyond the gap, are to be measured on *arcs* of the circle.



The horse will graze over (I) the sector Q M A N P (II) the sector R O S, (III) the twe quadrants R Q V and S P T and (IV) the two areas P N T and Q M V.

I. Sector Q M A N P = $\frac{3.14159 \times 75 \times 75 - 75 \times 20}{2}$ = 16921.44

II. Sector R O S = $50 \times$ R S = $50 \times \frac{80}{3}$ = 1333.33

III. Quadrants R Q V + S P T = $\frac{3\ 14159 \times 25 \times 25}{2}$ = 981.75

IV. Call that part of the rope, P T, not in contact with the circle, p, and the angle made by the radius, drawn to the point of contact, with O N, x; then p = 75x. Now if the rope move through a small angle, incr. x, the figure between the two positions of the rope and the evolute may be considered ultimately as the sector of a circle. Its area will then be ½p² incr. x. Hence, to obtain the area N P T, we have but to integrate ½ p²dx, or $\frac{1}{2} \times 5625x^2dx$, since p = 75x, between the proper limits. These limits are obviously o and angle P O N, or o and ⅓. Integrating, P N T = 34.72

Hence the required area is 16921.44 + 1333.33 + 981.75 + 69.44 19305.96 —B—

21. By Algebra.

Let x, y and z = number of apples at 4, ¼, and ½ cents, respectively.

Then 1. $x + y + z = 20$

2. $4x + \frac{y}{4} + \frac{z}{2} = 20$
3. $16x + y + 2z = 80$
4. $2x + 2y + 2z = 40$
5. $14x - y = 40$
6. $y = 14x - 40$

7. (3—1). $15x+z=60$
8. $z=60-15x$

Let $x=1, 2, 3, 4, 5$.
then $y=-26, -12, 2, 16, 30$.
and $z=45, 30, 15, 0, -10$.

The third condition is the only one in which the results are all whole numbers and greater than 0, $\therefore$ $x=3$, $y=2$, and $z=15$.

By Arithmetic.

			Diff.	Bal.	Sum.
1	4	3	12	1	5	6
	¼	¾	3	4		4
	½	½	2		30	30
						40

40:20:: 6: 3 } $\therefore$ 3, 2, and 15 are the
40:20:: 4: 2 } numbers respectively.
40:20::30:15 }

22. \$100—\$90=\$10, gain on first transaction.
\$100—\$95=\$5, " " second "
\$10+\$5=\$15, entire gain.

PROGRAMMES.

28. Oct. 24.

Harmonical Progression, Carroleane Tyrrell
Exs. 2, 6, 8, 11, 14 and 19, Pages 279–80–81
History of the Platonic School, C. M. Jansky

29. Nov. 7

Mahtematical Induction, T. I. Packard
Exs. 1–12, inclusive. Pages 284–85
History of the Peripaletic School, J. D. French

30. Nov. 21.

Permutations and Combinations, J. C. McGhee
Exs. 2, 5, 7, 8, 9, 10, 11, 12, 14 and 16. Pages 294–5.
History of the Sceptic School, H. S. Ward

31. Dec. 5.

Permutations and combinations, Addie Clark
Exs. 19, 21, 25, 28, 30, 32, 34, 35, 38, and 40. Pages 295–6 7.
History of the Cynic School, E. F. O'Riordan

THE EDITOR.

Dr. S. H. Peabody, ex-president of the University of Illinois, will serve as Director of the Department of Liberal Arts of The World's Fair.

State Supt. Vories is able to be in his office again, and is slowly coming back to health. One of his recent decisions is to the effect that trustees of an incorporated town can compel pupils to buy the adopted books and study music when it is one of the branches in the regularly adopted course of study, on penalty of expulsion for refusal.

The Knowledge that is of most Worth.

Some years ago, when the pedagogic world had just gone through the incubation period of object lessons and had entered the cackling stage, the writer attended a meeting of the N. E. O. Teachers' Association at Cleveland. The late William D. Henkle was present and sat with his usual patience through the afternoon, while others showed how the incubation was done and expressed their conviction of the viability of the brood. At the end of the exhibition, he arose and said he had been wishing that the association could hear John Tyndall give a lesson in the ragged schools of London. What Mr. Henkle had in mind was this: Professor Tyndall used to take a handful of magnets, or a pocketful of rock-candy, into the schools and talk to the urchins about magnetism or crystalization. As long as Tyndall would talk, the boys would listen, just as they would were one of their own number telling some story of the streets. Any one who has read one of Tyndall's books, The Forms of Water, for example, can understand how that could be. Whatever he sees, he sees with wonderful clearness, and his disposal of the proceeds of his lectures in our own eastern cities, shows how

much he wishes others to see what he sees. But the chief thing that made him the great teacher that he was, was his thorough and intimate knowledge of any subject which he proposed to teach. And it was not a knowledge in the clouds, but so thorough that it comprehended the ragamuffin's world, lifting that world up into a real connection with the world in which live the kings of thought. This is a matter that no young teacher should ever lose sight of. Socrates used to say that any person is eloquent upon any subject that he understands; by which Socrates meant, that any one can make another see what one sees clearly oneself. In the September Forum, President Jordan has the same thought, when he doubts if a really great investigator was ever a poor teacher. Of course, something more than a mere knowledge of the subjects to be taught, is necessary to successful teaching; yet, still, it is very certain that nothing can take the place of it. And the knowledge must be real; it must be a knowledge *of* the subject, not *about* the subject; of first intentions, not second, as the old schoolmen used to say. "Nothing," says Dr. William T. Harris, (Hegel's Logic, p. 55.) "so surely drives the living spirit of insight out of a system as to adapt it for use in schools"; and the remark applies to the so-called common branches as well as to systems of philosophy. It is in this way that the methodists get in their bad work. They keep insisting that there is some best way of presenting the subject; and that after the young teacher has some good mastery of his subject, he must still have some authoritative way of presenting it, or it will not reach the spot in the pupil's mental make-up. Nothing will more surely turn the school into a puppet-show than this; but the worst feature about it is, that no subject fitted to the schools needs any adapting, as Dr. Harris says, to the schools. Supposing the teacher to have the necessary requisites, good average intellectual ability, a real interest in the welfare of his pupils, what President Garfield once called gumption, that he may manage well, an equipment which no school can supply, and it may be safely affirmed that any failure comes from inadequate knowledge of the subjects taught.

Any teacher can be his own examiner in this matter; indeed, no one but the teacher can tell any thing about it, no examiner, nor any body of examiners. If the teacher can meet his classes, as he once met his mother, so full of his subject that he *must* tell it, or be tortured; there can be no question of his success. But his fullness must be of his subject not of something else, method, or psychology, or what not. He must not, as Lowell makes Apollo say of his pythoness, "err from not knowing if 'twas I or mere wind through her tripod was blowing."

What the young teacher must do is simply this: he must get his school-knowledge of the subjects to be taught in some class managed by some teacher of acknowledged ability in the premises, and then work at the subjects with an eye single to their mastery, remembering that no school can make a master, and that the gods give all good things to him that works. "Seek, and ye *shall* find; knock, and it *shall* be opened unto you." But the opening is always in the future, first one door and then another. At the end of one opened avenue, is always a closed gate. The known always ends; but the unknown opens to him who has faith to knock

and wait till the warder in his own good time turns the key.

Dawdling.

One of the incidental advantages resulting from examinations is the drill they afford in the practice of prompt and speedy work—of thinking under pressure.

Again and again some student reports to the writer, "I have spent so many hours on this lesson," or "I worked till midnight over that point," as if that alone were commendatory or could be considered an evidence of good studentship. The simple fact is that the practice of trifling dreamily for an hour over a point that might be mastered in fifteen minutes' rigorous work is injurious and reprehensible in the highest degree. It is the invariable experience of teachers that those students acquire the most power whose time is so fully occupied with various tasks that they are constantly obliged to husband it. The pupil with one or two studies rarely or never does as well as he who has three or four, because the former falls to dawdling while the latter learns to focus his powers and with effect. It is remarkable what might there is in concentration, and what weakness in diffusion. The solar rays whose warmth is scarcely felt, when collected by Ericsson's reflector, were amply sufficient to work a three-horse-power engine.

If a student spends half an hour over the solution of a problem that he should have mastered in five minutes he has utterly failed to derive the greatest benefit from that problem.

It would be a wise plan for teachers to inquire closely into the methods of study of those in their charge, not so much to see that time enough is spent in the preparation of a lesson, as to see that too much has not been used.

The Leland Stanford Jr. University.

The opening ceremonies of this great institution of learning occurred at Palo Alto, Cal., October 1.

As an individual benefaction, this is one of the noblest and most generous on record. The endowment is twenty million dollars.

Four hundred forty students, ninety-five of whom are girls, have been admitted to the various classes of the university. Fully one thousand one hundred applications have been made for admission to the institution.

Seven years ago Senator Leland Stanford lost, by death, his only son. The university has been erected as a memorial to that son. It is the chief object in life to Senator Stanford. It represents twenty years' thought and study by a practical and broad minded man. It is the means by which he hopes to make his great fortune of direct benefit to the youth of California. He has had in view mainly the large class of boys and girls who desire to make their own way in life. While the higher education will not be neglected, the greatest attention will be given to those special studies which will enable students to do something for their own support as soon as they are graduated. For this purpose, the schools in mechanic arts, in manual training, and in all the sciences, will be made the most perfect in the country. The collections already secured in botany, mineralogy, and geology are among the most valuable in the world; and in the other sciences, the collections and apparatus will, in time, be equally perfect.

Senator Stanford's son had always

shown the keenest interest in mechanics, and though only seventeen, he had developed a plan for a great museum which should be free to the people, and should be used to aid boys who were learning trades. After his death, his father determined to put into practice the plans of his son. A special act of the California legislature permitted the conveyance to trustees of property for the endowment of an educational institution. A board of trustees was appointed; a site near Senator Stanford's country residence was selected; and the necessary buildings were erected.

The architecture of the buildings is an adaptation of the California missions, low buildings, with heavy walls, and roofs of tile. They are built of cream-colored sandstone, are fourteen in number, each adapted to some especial department or purpose, and all handsomely fitted up and equipped with everything necessary for the comfort, convenience, and help of those who are to teach and to study there.

Much of the success of the final arrangements is due to the great executive ability and energy of the president, Dr. David Starr Jordan.

President Jordan is known to all Western teachers as the man who has made the University of Indiana what it is. He is not only one of our most eminent scientists, but is a man of broad culture, progressive, and far-seeing, and well fitted to stand at the head of such an institution as Leland Stanford Jr. University.

Chas. Stewart Parnell

was born at Avondale, Ireland, in 1846. He received his education at Cambridge, England.

He entered Parliament in 1875. He is the author of the Irish Church Act Amendment Bill, which had for its object, the assistance of the tenantry of Ireland to the purchase of their holdings. Though the Bill was defeated it brought Parnell into prominence, and made him leader of the so-called "obstructionists" in Parliament. In 1879 he founded the Irish National Land League. This organization had two main purposes in view, viz.—(1) To bring about a reduction of rack-rents, (2) to facilitate the gaining of ownership in the lands by the tenants. He visited America in the interest of this organization, and succeeded in raising a large sum of money in its behalf.

In 1880 he was returned for three constituencies, and chose to sit for Cork City. In the same year informations were laid against him by the Irish Attorney General. Though, after the trial the jury disagreed, the Land League was declared by the government to be an illegal association, and Parnell was arrested and carried to Kilmainham jail. His release was soon effected and he participated in the sessions of 1883, and was largely instrumental in procuring the passage of the Arrears Act, and the Tramways and Laborers' Act.

He afterward revived the Land League, under the name of the National League.

He was leader of the Irish Parliamentary party in 1884–85, and supported Gladstone in his famous Home Rule Scheme.

Thus far his history is that of a patriot and statesman. Honor, usefulness, power, were his, but, alas! "greatness, thy name is weakness." Like Brutus, "he was beguiled." The last year of his life was a struggle to maintain his leadership, when he had ceased to be

worthy of it, and had been deserted by most of his best and noblest friends.

We must honor his patriotism and statesmanship, and deprecate his violations of morality. Mr. Parnell's influence upon the political status of England, can not be overstated, and his part in the struggle for Irish liberty will render him a prominent figure in history. The political situation will not be materially affected by his death for the reasons before intimated.

The Teacher as a Business Man.

If teaching means any one thing more than another, it means systematizing, and the teacher of all persons, should be the one who has the most method in his work and who pursues the most systematic and definite plans. This demands that teachers should have the very best business knowledge and business habits; and yet, they are more deficient than any other class in business habits and even business knowledge.

The subject of percentage and commercial paper in general is the poorest understood of any subject taught in our schools. There is more complaint about it at Teachers' Meetings and Teachers' Institutes, and there are more calls for help on this than on any other one thing.

At ordinary examinations for teachers or examinations for pupils who are closing their work in the subject of arithmetic, there will be more failures in Percentage and Commercial Paper than on any other subject. This all comes of a lack of business knowledge and business habits among the teachers. The study of book-keeping would correct this difficulty very much but not entirely. Every teacher should see to it that he is acquainted with the best business methods and that he has a knowledge of commercial paper in all its ordinary forms, and that he understands the law governing ordinary business transactions. The young man who reaches the age of fifteen, and who may then "go to school of winters only", ought to be thoroughly familiar with the general idea of business. And yet, there is not one out of a hundred who could with any certainty, draw up a very simple note for the simplest loan of fifty dollars. This is not because of the dulness of the student, or the fact that his time of attending school is so much broken, but is wholly the fault of his instructors, who can not give correct assistance upon anything that they themselves are ignorant of. Every teacher should make it a point, himself, to transact in the legitimate way, all business that he can. By making a careful study of notes, drafts and commercial paper in general, watching transactions with care in his own family and in neighboring families, he can, in a few months at least, make himself fairly competent, and thus be prepared to not only protect his own business but assist his pupils.

A fair knowledge of business methods and business forms on the part of the people in general, would do away with nine-tenths of the litigation which we have. While there still must be plenty of work for the courts and lawyers, as matters now are they have more business than should properly go to them. Fully ninety per cent. of all litigation occurs because of the ignorance of the parties who are involved in it.

Campbell and McKinley.

Ohio still clings to the old time custom of joint discussion during political campaigns.

The giants who bared their intellectual arms and made battle before the Buckeye multitude this year, were Governor Campbell and Mr. McKinley, the author of the famous McKinley Bill. The reputation of these men gave promise that knock-down blows would be dealt in the contest, but strange to tell, the conflict lacked spirit, and was, to say the least, comparatively mild. The real point at issue between the two great parties were scarcely touched.

Some of the details of the McKinley Bill were discussed, and personal allusions were bandied back and forth, with but little effect. The real point of difference between these combatants on the Silver question was elaborated by Mr. McKinley, but the tariff issue was not argued on its merits by either of them. We are of opinion that the large crowd of voters who listened to these famous disputants went from the meeting with their political faith unchanged. There was nothing in it to influence an intelligent voter to change his politics. This being true the question very pertinently arises, what good came of it? Well, it is a good thing to have the people see and hear their champions, as they face each other on the platform.

It tends to cultivate a spirit of fairness in partisan politics. Misrepresentation is more difficult, and falsehood, which has accomplished such wonders in American politics, is placed at a disadvantage. We incline to the belief that joint debates are to be encouraged so long as the speakers are of such ability and character as to place them above demagogism and personalities.

Indiana's Educational Exhibit in 1893.

The Committee of Education of the Indiana Board of the World's Fair Managers have decided that the proposed exhibit shall consist of three distinct departments, viz., I. An historical display presenting the progress of school legislation; the influence of private enterprise in educational development; what charitable and religious institutions have done; the progress and general character of teachers; the growth of public sentiment; the history of school appliances of all kinds.

II. A statistical display presenting facts relative to courses of study, average attendance, character of teachers and school officers, etc.

III. The display of the work of the schools.

To get the matter before the schools, to interest pupils, teachers, patrons and school officers in this important matter, Mrs. Harrell, Sec'y of the Committee, has proposed the following plan to be followed out in the schools of the state, and the scheme has received the endorsment of the State Department of Public Instruction.

The fourth Friday in November, 1891, and the eleventh day of February, Washington's birthday (old style) 1892, are to be set apart as Exposition days, on which a program of patriotic, historical and social exercises is to be rendered by the school. For the first Exposition Day it is suggested the schools take up the study of the life of Columbus, his voyages and discoveries, also patriotic songs, recitations and facts by pupils and teacher, relating to the Columbian Exposition.

For the second day let the exercises be of much the same character—historically treating of the war of Independence and progress of the Nation.

On each of these days, a collection is to be taken as follows:

From the pupils, one cent; from the teachers, ten cents; from the principals of high schools, twenty-five cents; from County Superintendents, City Superintendents, Township Trustees, and members of School Boards of Towns and Cities, and College Professors and Presidents, fifty cents.

This money collected by the teacher is to be turned over to some one selected by the County Superintendent in each school corporation, who will turn it over to the County Superintendent, who will then forward it to Hervey D. Vories, Superintendent of Public Instruction, Indianapolis, Ind., who will receipt for it. The aggregate thus

collected will in turn be turned over to the Treasurer of the Educational Committee of the World's Fair Commission.

This money will be used for the educational exhibit only, and will be duly credited to the school children and teachers of the state. By this manner of concerted action, Indiana will be placed in a position to maintain her merited vantage ground held by her in the educational contest with her sister states at Philadelphia in the Exposition of 1876.

THE SCHOOL.

Shall we have a reunion in '93? So far as I know this project originated with some of the members of the class of '81, and something like an organization was effected and some details agreed upon.

In a circular letter issued over a year ago other classes were invited to join them and the matter was freely discussed by those alumni who were here last August, and every body was enthusiastic over it. THE STUDENT has been repeatedly asked to take it up, and willingly promises to lend every aid in its power. One thing we can do :—we can promise you a royal welcome. Now let us put our heads together and prepare for the reunion if we are to have one. Will those of the class of '81 who have the matter in charge let us know just what has been done so far? And will every graduate from this school who reads this let us know at once what he thinks of the feasibility of the plan, and how, in his opinion, it had best be carried out? I'd like to hear from just as many as possible. What do you say?

The chief literary event of the term was undoubtedly the lecture of Prof. Julius E. Olson before the Scandinavian society, on old Norse literature, history and mythology.

The occasion was the annual celebration in honor of Leif Erikson who, it is claimed by Scandinavians generally, was the first white man who set foot on American soil.

Crescent,

Ex.-Pres. E. E. Combs, classic of '89, is principal of the High School at Sorento, Ill.

The talk given by Prof. Carver on our schools was both interesting and instructive and was well appreciated by all who heard it.

Among the lately elected members are C. E. Noble, P. H. Moroney, Eugene Peaveler, J. P. Frantzen, A. L. Barthel, J. F. Easter, W. D. Millikin, Clara McKinstry, W. D. Brode and Marie Adams. A. C. P.

The Star.

W. H. Tompson, one of our best elocutionists, is now teaching elocution at Cheholis, Wash. He has had fine success both in teaching and giving public readings through the west.

Misses Mary Wertman and Minnie Prout, two of our music people and graduates of the musical department of this institution, have returned and entered upon other work in the school. Their many friends extend to them a hearty welcome.

Louis Zoch, we are glad to hear, has a splendid position in the Sunny South. He is teaching at Salem, Ala., and is well pleased with his work.

N. C. Stott has been re-elected principal of the public schools of Burrton, Kansas. The people of Burrton recognize his ability and appreciate the energy and vim with which he goes at his work.

The greatest novelty of the society this term was a program executed entirely by ladies, which was given the fifth meeting. Those who took part in the literary part of the exercises were Mrs. Carver, Misses Sarah Ream, Vertie Warfield, Anna Cooper and Clara Allen. I am unable to give the names of those who furnished the music for the evening. The programs both literary and musical, were excellent; and every one who heard them was highly gratified. The universal verdict is that it was one of the best meetings of the term.

AMONG THE MAGAZINES.

It is worth everybody's while to buy the November WIDE AWAKE, for three notable features: *The Boyhood of Hawthorne*, by his relative, Mrs. Richard Manning of Salem, Mass., which is full of family anecdote and gives a photograph of the first portrait painted of Hawthorne; the closing chapters of Margaret Sidney's famous Peppers serial; and *Nolan*, a ballad by Mrs. Laura E. Richards, giving the tragic story of the bearer of Raglan's dispatch to Lucan's *Light Brigade*, when they made the famous *charge* at Balaklava.

Miss Isabel F. Hapgood who has translated a large number of Tolstoy's books writes on *Count Tolstoy at Home*, in the ATLANTIC for November. Prof. W. J. Stillman's paper on Journalism and Literature will be read with disfavor by the journalist, and by the litterateur with delight. Lafcadio Hearn has a paper on life in Japan and James Bradley Thayer writes on *A People without Law*—the Indians. There are also some excellent stories.

The Isles of Many Names is the title given to an interesting description of the Canary Islands which forms the opening article in PETERSON'S MAGAZINE for November. The rest of the number is mainly given to a number of exceptionally interesting stories and short articles on home decoration.

The publishers of GOOD HEALTH announce that their subscription list has more than trebled since the beginning of the current year. It is a deservedly popular journal.

In THE FORUM for November Edward A. Freeman, the English historian, the highest living authority perhaps on the subject, explains the political situation in Europe, pointing out the specific dangers to peace. Another remarkable article will appear in the same number on the armies and politics of Europe, from an American point of view, by Mr. William R. Thayer, who records the results of studies recently made in Europe of the political and military situation. These two articles together made a complete review of the present European situation, and give a clear understanding of the status of each of the great powers.

The NEW ENGLAND MAGAZINE is undoubtedly the leading illustrated monthly published outside of New York City. The most striking article in the November number is the initial paper on *The Home and Haunts of Lowell*, by Frank B. Sanborn. Other interesting articles are *The Start from Delfshaven*, *A Future Agriculture* and *Why the South was defeated in the Civil War*.

THE COSMOPOLITAN MAGAZINE has devoted 28 pages of the November number to a most interesting and exhaustive article upon Chicago. Count Jacassy, who spent some time on the ground for that purpose, and Harry Fenn, have illustrated the most charming features of the city by twenty-eight sketches. An article upon Alfalfa Farming in this number, is by John Brisben Walker, who, as the result of ten years spent in the saddle, in direct superintendence of his farm *Berkeley*, one of the largest Alfalfa farms in Colorado, gives the reader much valuable information in regard to the irrigation and curing of the wonderful plant which is destined to become one of the most valuable products of the United States. General Sherman's letters to his daughter written from the field during the war, are among the most valuable contributions that has yet been made to the literature of the war. Judge Tourgee furnishes *An Outing with the Queen of Hearts*.

Mrs. Henry Ward Beecher, Russell Sage, Palmer Cox, Ella Wheeler Wilcox and Dr. Talmage are among the host of contributors who make up the November number of THE LADIES' HOME JOURNAL. The number is a gem.

PUBLISHER'S PAGE.

With the December number THE STUDENT will complete its first year, and the first number of the second volume will be enlarged and issued in new dress. Those who received the circular announcement last January will remember that we then proposed to publish a monthly journal of 32 pages, and with this intention the subscription price was fixed at $1.00 a year. A very little experience, however, soon convinced us that the demands of our subscribers and patrons necessitated a much larger and more complete publication than we at first projected. Hence the January issue appeared with 52 pages, and this number was afterwards increased to 54 pages of reading matter every month.

It is now, therefore, nearly double the size first proposed. In view of all this and the superior mechanical features of THE STUDENT, features that are not equalled by any journal of its class, we have been obliged to place the subscription price for the second volume at $1.25. This slight increase will affect our patrons but little, and will make a very great difference to us.

Hereafter, as heretofore, every cent received will be expended on the journal, so that our patrons will feel assured that they are receiving the full worth of their money.

* * *

A GREAT OFFER.

In view of the fact that after Jan. 1, '92, the subscription price of THE STUDENT will be $1.25, we make this special offer to all cash subscribers sending us their subscriptions before that date:

To all such we will send the November and December numbers *free, thus giving fourteen numbers for $1.00,* whereas after January 1, the invariable price will be $1.25 a year.

* * *

Many complaints have been received this month, from all parts of the United States, of the non receipt of the October issue. We beg to say to all our subscribers that THE STUDENT is mailed regularly, about the first of each month; and in case it does not reach you by the tenth, inform us and a second copy will be sent to you. We take the utmost pains with our mailing list, but matter of this class, will sometimes be miscarried.

* * *

Subscribers changing their address should let us know promptly, stating both the old and new address plainly. Don't put this off, as it is, sometimes, the cause of the non-appearance of your paper.

* * *

Our proposed new department, consisting of answers to questions, solutions of examples, etc., will be begun in the December or January number.

If you want to know the best means of presenting any subject in your school, where to find information on any subject, how to answer any question in history, grammar, arithmetic, etc., what books to read or not to read; or wish information, which we can give on any subject, likely to be of general interest, write to us and we will give you all the assistance in our power. We want to make THE STUDENT a friend of yours, and a necessity to you.

* * *

No attention will, hereafter, be paid to correspondents asking for information, unless their communications be signed in full. A correspondent asking for information by mail, should never fail to inclose sufficient stamps for return postage.

SEPTEMBER EXAMINATION QUESTIONS FOR INDIANA.

CONDUCTED BY O. P. McAULEY.

READING.

"Let us draw a lesson from nature, which always works by short ways. When the fruit is ripe, it falls. When the fruit is dispatched, the leaf falls. The circuit of the waters is mere falling." —*From Ralph Waldo Emerson's Essays.*

Ask five questions on the above suitable to bring out the meaning. 5 points, 10 each.

All exercises in oral reading to be marked from 1 to 50.

ANSWERS.

1. What is meant by nature working by short ways?
2. What is the antecedent of which?
3. Express the meaning of the second sentence in your language.
4. What is meant by the fruit being dispatched?
5. Why is the comparison made between fruit and water?

ARITHMETIC.

1. Simplify: $\dfrac{3\frac{3}{4}+5\frac{3}{8}-4\frac{1}{16}}{3\frac{1}{12}\times 2\frac{2}{5}\div 2\frac{1}{2}}$
2. Find the value of .01875 of 1 cwt. 40 lbs.
3. A pendulum vibrates 1.375 times a second; how many times will it vibrate in a week?
4. The wheels of a bicycle are 5 ft. and 1½ ft., respectively in diameter; how far will it have traveled when the smaller wheel has made 80 more revolutions than the larger? (The circumference of a circle is 3.1416 times the diameter.)
5. At what rate per cent. will $900 become $1,068.75 in 3 years 9 months?
6. A man bought ⅞ of an acre of land for $56, and then sold ⅖ of an acre at cost; how much did he receive for it? (Solve by analysis and give the analysis in full.)
7. Five-eighths of a stock of goods was destroyed by fire, and ⅜ of the remainder was damaged by water, and the uninjured goods were sold at cost for $5,280; what was the cost of the entire stock of goods?
8. Sold a village lot for $230, which was 8 per cent. less than it cost. Had it been sold for $300, what would have been the gain per cent.?
9. What will it cost to plaster the walls and ceiling of a room 54 ft. long, 35 ft. wide and 16 ft. high, at 33 cents per square yard?

ANSWERS.

1. $\dfrac{3\frac{3}{4}+5\frac{3}{8}-4\frac{1}{16}}{3\frac{1}{12}\times 2\frac{2}{5}\div 2\frac{1}{2}}=\dfrac{\frac{60}{16}+\frac{86}{16}-\frac{65}{16}}{\frac{37}{12}\times\frac{12}{5}\times\frac{2}{5}}=\dfrac{\frac{81}{16}}{\frac{74}{25}}=1\frac{841}{1184}$ ans.
2. 1 cwt. 40 lbs. = 140 lbs.
   .01875 × 140 lb. = 2.625 lbs. ans.
3. 1 wk. contains 7 × 24 × 60 × 60 sec. = 604800 sec.
   If in 1 sec. it makes 1.375 vibrations, in 604,800 sec. it will make 604800 × 1.375 vibrations = 831600 vibrations. ans.
4. Since the circumference of the large wheel is 5 × 3.1416 ft., the bicycle will travel that far for each of its revolutions; but for 1 rev. of the large wheel the small one must make $\dfrac{5\times 3.1416}{1\frac{1}{2}\times 3.1416}$ rev. = $\frac{10}{3}$ rev.,
   thus gaining $\frac{10}{3}-1=\frac{7}{3}$ rev. Then if to gain $\frac{7}{3}$ rev. the bicycle moves 5 × 3.1416 or 15.708 ft., to gain 1 rev. it will travel $\frac{3}{7}$ of 15.708 ft., or 6.732 ft. and to gain 80 rev. it will travel 80 × 6.732 ft. = 538.56 ft. ans.
5. $1068.75 − $900 = $168.75
   Int. for $3\frac{3}{4}$ ($\frac{15}{4}$) yrs. = $168.75
   " " 1 yr. = $\frac{4}{15}$ of $168.75 = $45
   $9 = int. on $900 for 1 year at 1%
   $1 = " " $900 for 1 yr. at $\frac{1}{9}$ of 1% = $\frac{1}{9}$%
   $45 = " " $900 for 1 yr. at 45 × $\frac{1}{9}$% = 5%
6. ⅞ acre cost $56
   1 acre cost ⅞ of $56 = $64
   Since 1 acre cost $64
   ⅖ acre costs ⅖ of $64 = $25.60
   ∴ he received $25.60.
7. ⅜ of stock − ⅝ = ⅜ of stock, not destroyed by fire.
   ⅖ of ⅜ of stock = $\frac{9}{40}$ of stock, injured by water.
   ⅜ of stock − $\frac{9}{40}$ of stock = $\frac{3}{20}$ of stock uninjured. $\frac{3}{20}$ of stock cost $5280
   $\frac{1}{20}$ " " " ⅓ of $5280 = $1760
   $\frac{20}{20}$ " " " 20 × $1760 = $35200 ans.
8. 100% = cost.
   100% − 8% = 92% = $230
   1% = $\frac{1}{92}$ of $230 = $\frac{230}{92}$ = $2.50
   100% = 100 × $2.50 = $250 = cost.
   $300 − $250 = $50, gain.
   $250 = 100%
   $1 = $\frac{1}{250}$ of 100% = $\frac{10}{25}$%
   $50 = 50 × $\frac{10}{25}$% = 20%
9. The length of the four walls is 54 ft. + 54 ft. + 35 ft. + 35 ft. = 176 ft., and, as the height is 16 ft., they contain 2848 sq. ft. As the ceiling is 54 ft. × 35 ft. it contains 1890 sq.

ft. 2848 sq. ft. + 1890 sq. ft. = 4738 sq. ft. or $47\frac{38}{9}$ sq. yds.

1 sq. yd. costs 33 cts.

$47\frac{38}{9}$ sq. yds. cost $47\frac{38}{9} \times 33$ cts. = \$173.72⅔

GRAMMAR.

1. The characteristic peculiarity of Pilgrim's Progress is that it is the only work of its kind which possesses a strong human interest. Designate each clause and specify its use in the sentence.

2. Write a complex sentence whose subordinate clause is itself complex.

3. Make needed corrections and explain each:
   Every one can not keep a coach.
   I merely came to ask you a question.
   If I do not study I will be punished.

4. Beautiful and salutary as a religious influence is the sound of a distant Sabbath bell.
   Give construction of "salutary", "influence" and "as."

5. What parts of speech possess the property of comparison? What ones possess person?

6. Which parts of speech may connect subordinate clauses to principal ones, but may not connect coordinate ones?

7. Under what circumstances is it proper to omit the sign "to" from the infinitive?

8. Use *since* as a conjunction, as a preposition and as an adverb in successive sentences. Designate each.

9. Use *shall* or *will* in sentences so as to express the following ideas: *a*. A promise in the first person. *b*. Futurity in the third person. *c*. A command in the second person. *d*. Futurity in the second person. *e*. A determination in the first person.

10. Illustrate by sentences the difference between a compound sentence and a sentence with a compound subject.

ANSWERS.

1. The characteristic peculiarity of Pilgrim's Progress is that it is the only work of its kind which possesses a strong human interest. The first clause is "that it is the only work of its kind which possesses a strong human interest." This is a substantive clause, used in the predicate with "is." The second clause is, "Which possesses a strong human interest." This is a relative clause and belongs to "work."

2. The house which he purchased of the man who lives in the city was destroyed by the storm.

3. Any person cannot keep a coach. "Every" implies all.
   I came to ask you a question merely. As the sentence stands it indicates the modifier of "I."
   If I do not study I shall be punished. "Will" denotes necessity, so stated by grammars. In one sense the sentence is correct as it is.

4. "Beautiful and salutary as a religious influence is the sound of a distant Sabbath bell." "Salutary" is an adjective used in the predicate and belongs to "sound." "Influence" is a noun, the object of the preposition "as."

5. What parts of speech possess the property of comparison? Adjectives and adverbs. What ones person? Nouns and pronouns, and verbs in agreement.

6. Which parts of speech may connect subordinate clauses to principal ones, but may not connect coordinate ones? Relative pronouns, relative and conjunctive adverbs, and all subrodinate conjunctions.

7. Under what circumstances is it proper to omit the sign "to" from the infinitive? After such verbs as bid, dare, make, let, go, etc.

8. Use *since* as a conjunction, as a preposition and as an adverb in successive sentences. Designate each. As a conjunction, "Since he is here I will go". As a preposition, "He has been here since that time". As an adverb, "I since have learned not to trust him".

9. *a*. I shall go. *b*. He shall repent it in coming years. *c*. You shall prepare the exercise. *d*. You will remain for the work of the morrow. *e*. I will go.

10. Illustrate by sentences the difference between a compound sentence and a sentence with a compound subject. "John went to town, but Mary went to school." This is a compound sentence composed of two distinct members. "John and Mary go to school", is what is called a partial compound sentence.

PHYSIOLOGY.

1. Contrast the arteries and the veins as to structure. and give reasons for the difference. 15.

2. Draw a diagram of the heart, locating and naming its cavities and valves. 15.

3. What two kinds of nerve tissue are there? What is the probable function of each? Give reasons for your answer. 15.

4. Why does exercise raise the temperature of the body? State fully. Why does clothing? 15.

5. What is the best arrangement of light in a school room to prevent injury to the eyes? 10.

6. Explain the following terms: Mastication, digestion, absorption, secretion, assimilation. 15.

7. Where is the eustachian tube, and what office does it perform? Distinguish between a dislocated and a fractured bone. 15.

ANSWERS.

1. Arteries are thick walled and elastic ; Veins are thin walled and flaccid. Arterial pressure is one of the forces of circulation.

2. The cavities of the heart are the right auricle, right ventricle, left auricle and left ventricle. Between the first named cavities is the tricuspid valve; between the left auricle and left ventricle is the bicuspid valve. Semilunar valves guard the great arterial trunks arising from the heart.

3. Cellular nerve tissue, conveys nerve energy. Fibrous nerve tissue generates nerve energy.

4. It increases oxidation, and the arrest of mechanical motion. Clothing retains the heat.
5. Diffused light. It should fall upon the work not upon the eyes of the pupil.
6. (a) The process of comminuting the food and mixing it with saliva. (b) The process of converting food into soluble material ready for absorption. (c) The process by which products of digestion are conveyed into the blood. (d) The process of gland activity. (e) The process by which the products of digestion become tissue.
7. It leads from the pharnyx to the middle ear. It admits air to the latter.
   A fractured bone is broken, a dislocated bone is displaced.

GEOGRAPHY.

1. Name the states of this country through which the fortieth degree of north latitude passes.
2. Give the location of the Bahama Islands with reference to the United States. To what country do these islands belong?
3. Bound the newest State of the United States, and give its capital.
4. What are the chief differences between a town and a city?
5. Write a short account of the country of Chili under the heads of location, extent of territory, productions, and characteristics of the inhabitants.
6. Bound your own county, and draw a map of the same showing the townships.
7. In what respect may the British Isles be said to surpass other nations of the world?
8. Where is Calcutta? What can be said of its commercial importance?
9. Give the location of the Sandwich Islands with reference to San Francisco. Of what origin are these islands supposed to be.

ANSWERS.

1. California, Nevada, Colorado, Missouri, Illinois, Indiana, Ohio, Pennsylvania, New Jersey.
2. (a) South-east of the United States.
   (b) Great Britain.
3. (a) Dominion of Canada, Montana, Wyoming, Utah, Nevada, Oregon and Washington.
   (b) Boise City.
4. Size and municipal government.
5. (a) South western part of South America. (b) All of the coast-strip south of Peru including the islands along the coast, and the land on both sides of the Strait of Magellan except a small part on the east side. (c) Guano, nitre, gold, silver, copper, wheat and fruits. (d) They are enterprising, the majority are whites, and several nationalities are represented.
7. Foreign commerce, foreign possessions, manufactures.
8. (a) Near the mouth of the Hoogly river an arm of the delta of the Ganges. (b) The second commercial city in India.
9. (a) In the Pacific Ocean, south-west from San Francisco. (b) Volcanic.

HISTORY.

1. What were some of the events in Europe for which the fifteenth century was noted?
2. Give the number of voyages made by Columbus to the new world.
3. When and where was African slavery first introduced into what is now the United States?
4. Give approximately the time of the founding of each of the following: Yale College, College of William and Mary, King's (now Columbia) College, Princeton College.
5. State several leading facts about Jonathan Edwards.
6. Describe the founding of Georgia.
7. When and where did the first Continental Congress meet, and what were its principal acts?
8. What were the causes of the war of 1812?

ANSWERS.

1. The principal of the events were
   1. The Crusades.
   2. The travels of Marco Polo and others.
   3. The explorations of Prince Henry of Portugal.
   4. The improvement of the Mariner's Compass.
   5. The invention of Printing.
   6. The beginnings of the Protestant Reformation.
2. Four.
3. Into Virginia in 1619.
4. Yale in 1701.
   William and Mary in 1692.
   King's in 1754.
   Princeton in 1746.
5. 1. Jonathan Edwards was born at East Winson, Conn. in Oct. 1703.
   2. He began the study of Latin at 6 years of age.
   3. At the age of 10 years, he wrote a paper ridiculing the idea of the materiality of the soul.
   4. He entered Yale College in 1716.
   5. He was converted in 1717, at which time he says God's excellency, wisdom, purity and love were revealed to him "in the sun, moon, and stars, in the clouds and blue sky, and in the grass, flowers and trees, in the water and in all nature."
   6. He was severely persecuted for trying to purify the commuuion services.
   7. He is said to be the greatest metaphysician that America has yet produced.
   Note: See S. E. Dwight's life of Edwards.
   " S. Hopkins' " " "
   " S. Miller's " " "
6. Georgia was settled in 1733 by Jas. Oglethrope. He received a grant of territory in the New

World for the purpose of making a home for the poor and oppressed of England. He formed an association which was to be governed by a Board of Trustees for 21 years. At the end of 21 years they gave up their possessions and was ruled by a governor appointed by the king, and an assembly chosen by the people.

7. At Philadelphia in Sept. 1774.
   1. A petition to the king.
   2. A declaration of rights.
   3. A non-intercourse agreement.
   4. An appeal to the people of Great Britain.
   5. An address to the people of Canada.

8. Impressment of American seamen.

SCIENCE OF EDUCATION.

(*Applicant to answer any seven questions.*)

1. Name some of the leading excellences in the Common School system of Indiana.
2. What means may be used by the school to cultivate the esthetic nature of children?
3. Some teachers require all answers to questions in recitation to be given in complete sentences. Give your estimate of this practice.
4. In teaching elementary geography to children, to what extent may natural objects be studied directly? Give examples.
5. What do you consider the educational value of learning definitions in any subject?
6. What is the nature of the mental activity involved in parsing?
7. A student in physiology dissects an eye and makes a direct and accurate study of the subject; what forms of mental activity does he put forth?
8. Define the terms: Proof, conviction, demonstration.
9. What is the function of the "Opening Exercises" in the school?
10. What is an esthetic judgment? An ethical judgment?

ANSWERS.

1. Its school-fund is large; it sustains school as long as school should be sustained; it is unsectarian and not political.
2. Any means that will make the children acquainted with what is beautiful,—pictures, neat buildings, yards, etc.
3. It is foolish.
4. To any extent that is practicable.
5. Great in its proper place.
6. Generalization chiefly.
7. Probably all forms.
8. Proofs are the means of conviction; demonstration is the presentation of the proofs; conviction is the result of demonstration.
9. To get the school started in the day's work.
10. An aesthetic judgment is a judgment about what is or is not beautiful; an ethical about what is right or wrong.

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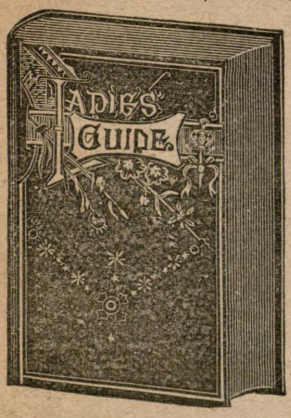

By J. H. KELLOGG, M. D.,

Member of the American Association for the Advancement of Science, American Public Health Association, American Society of Microscopists, Michigan State Medical Association, State Board of Health of Michigan, Editor of "Good Health," Author of "Home Hand Book of Hygiene and Rational Medicine," "Man, the Masterpiece," and various other works.

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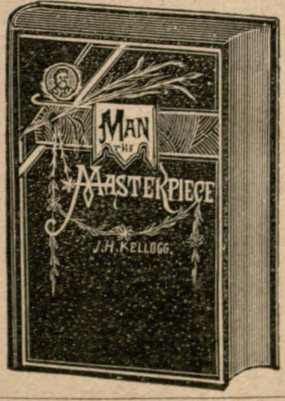

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